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SCIENCE AND INTERNATIONAL POLITICS

BY modern use, science has come to signify natural philosophy, or verifiable knowledge acquired by observation and experiment. When its field of work is thus defined, there is an impermeable membrane between science and politics. The partition is dissolved when science—the domain of reason—is defined as systematic and formulated knowledge in all fields of human understanding—natural, moral, social and political. At all stages of civilization, these factors have determined the conditions of human life in varying degrees; and in modern times scientific knowledge has been the chief element in the constitution of man's outlook and the greatest power for social and political action.

As science, using the word in the sense now generally understood, is kept apart from politics, it has little influence upon the uses to which this power is applied, whether for good or evil. In general, this influence is not given effective attention in political and social philosophies; and the attitude towards it to-day is much the same as that of Plato towards the results of observational and practical inquiry represented by the Ionian school, upon the principles of which physical science may be said to be founded. In Platonic politics, the State decided what was good for the peoples to know and accept, and the purpose of legislaton was to ensure the stability of a society of rulers and slaves. The spirit of political Platonism still prevails, even though modern science and technology have placed a score of mechanical slaves at the disposal of every citizen in a modern State.

In the understanding of this increased

power, and in action based upon it, political leaders can scarcely be said to take adequate account of the changing conditions of life due to applications of new scientific knowledge, either in the present or for the future. They are in charge of the forces of science, and upon them is the responsibility of seeing that these are used effectively for the progressive welfare of the community. In this relation to politics, the functions of science may be compared with those of an intelligence department which possesses knowledge of the equipment available everywhere for social or political development, but has no influence upon action derivable from it.

In a democratic State, the uses made of science, like those provided for defence or attack on land, sea, and air, are decided by leaders elected by representatives of the people. If these representatives rarely include men distinguished for their contributions to useful knowledge, it is because such original investigators find the air of the research laboratory more congenial and productive than the turbulent atmosphere of politics. In the discussion of any subject, the value of the views expressed depends upon the first-hand knowledge possessed of it. This is as true of politics as it is of science, though in these two fields rhetoric and fact differ in their influence. As the forces of science are in action along the whole front of advancing civilization, it is essential that their strength and their disposition should be given full consideration in all social and political campaigns. Their leaders have a right and a responsibility to their colleagues as well as to other fellow-citizens to share in the preparation of schemes of operation in which their forces are used. When they enter the field of politics, they possess at least as much general knowledge of the problems involved as is required of representatives of other interests, whether industrial, commercial and financial, or of the armed forces. Their views can have no special authority outside the scientific field to which they have devoted particular attention; but they may justly claim to have been trained to face facts before arriving at judgments; and the value of their public service depends upon their competence to transfer this faculty to the consideration of social and political problems.

One reason why few men of science care to take an active part in politics, is that they do not feel able to effect such a transfer of their trained habits of thought. Birth, social surroundings and feeling largely determine the side taken in national politics, but all these have little to do with the making of scientific students and discoverers. It is only by applying to political problems the principles of independent inquiry and impartial judgment demanded of investigators in all branches of natural knowledge, that politics can become a science and scientific workers as such can contribute to its advancement. Without this spirit and purpose science and politics are best placed in different categories.

There is, however, a vast difference between party politics of a national kind and international politics in which the world is the unit and all men are citizens of it, having rights and duties to be wisely adjusted with the object of ensuring progressive development everywhere. This is the field into which the international spirit of science can enter without being regarded as

an intruder or becoming involved in controversial national politics. The world is the possession of man and his endeavour should be to see that its resources, with the powers provided by science, are used for effective development. National boundaries have little relationship to the distribution of natural resources, and less to the needs of modern life. All communities can share in the achievements of scientific discovery and invention, and none can establish an exclusive right to the use of them. Radio communication and aviation have made it impossible for any one nation, or group of nations, to isolate itself from the others, whether near or far. There will be no need for any civilized community to strive for self-sufficiency in a single region, or within a political sphere of influence, when these world powers become agents of international politics. The way may be far to go before national interests will acquire an international outlook, yet the tendency of political groups to become larger gives promise of further expansion into a commonwealth of the chief free peoples of the world.

Such a commonwealth can be secured only by consent, and in it there will be no place for the mastery by force of one race or nation over another. No new world order can have stability unless each nation is free to follow its own lines of cultural development, and does not seek to deprive others of the same liberty. There can be patriotism without arrogance and unity without aggressive imperialism. What is wanted now is not pride of power to make one nation submit to the will of another, and the exercise of it to secure mastery of the world, but pride in a union upon the strength and structure of which each nation depends for freedom and security.

It is only with such a co-operative alliance in mind that the services of science can be used to shape the course of international politics. Knowledge of natural objects and phenomena—their properties, occurrence and range—is not confined to political regions, either in extent or in the use of it. This knowledge is free to the world, and is the foundation upon which the structure of modern civilization is based. It is continually revealing new sources of supply of materials and power to expand this structure as well as to adorn it. Applied science has provided the means of making the world's abundance available to all peoples. The world is, indeed, self-sufficient to supply the needs of all mankind, and the aim of international politics should be to see that the supply is adjusted according to the need for the use of it.

In the fourth clause of the Atlantic Charter, Mr. Roosevelt and Mr. Churchill expressed the intention of the United States and the British Commonwealth to adopt this principle in a unified political policy. The clause declares that "they will endeavour, with due respect for their existing obligations, to further enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity".

This Anglo-American declaration, with the power of two great democracies to implement it, gives an impressive outlook to a new world order. No federation of European States alone could make such a declaration of the effective value represented by the unification of purpose of the British

and American Commonwealths. When the principle of freedom of access to the raw materials of the world is conceded by the chief nations of the world, the problems of international politics will be greatly simplified and science will become the chief factor in their solution.

What exists in the world, and what uses can be made of it, are discovered by scientific inquiry and its application. What action is taken upon the knowledge of power thus gained depends upon communities and their governments. Knowledge of natural forces and resources gives no control over them but only an understanding of cause and effect available for human service. Science as such is concerned with the advancement of natural knowledge, and its standards of value are neither ethical nor political. Scientists, therefore, make no special claim to express opinions upon political matters, except in so far as their pursuits affect the welfare of the community, and its repercussions with them. When, however, they give close attention to subjects outside the particular fields they have made their own, their reactions are at least as worthy of consideration as those of other enfranchised citizens.

The view that the sole function of scientists is to study and discover natural facts and principles without regard to the social implications of the knowledge gained can no longer be maintained. It is now widely acknowledged that science cannot be divorced from ethics or rightly absolve itself from the human responsibilities in the use of its powers in economic or political planning. Scientists neglect their duty if they continue to retain the monasterial habits which society commonly assigns to them and are content to remain isolated from the structure of civilization built up from materials provided by them. It is their obligation as citizens to assist in the establishment of a rational and harmonious social order out of the welter of human conflict into which the world has been thrown because the powers they have released have not been rightly used in the services of mankind as a whole.

To suggest that the world is a single unit in which all men have certain fundamental rights to live and work, each according to his capacity and needs, may not be practical politics—national or international—yet these are the basic factors in the world's equation. Science and ethics should be able to agree as to the rights of all men to a place on this earth of ours and their duties to the community. Until international politics mean something more than a survey of national claims and actions, with no scientific or ethical principles upon which to arbitrate, expediency and not righteousness, must continue to determine its judgments.

Before any worthy world order can be established, the fundamental rights of men and communities must be defined and acknowledged by the democracies which promote it. The Anglo-American Charter represents the beginning of the infusion of this spirit into the working of the world affairs. The outlook of international politics is vastly extended by this Charter, and an instrument has been constructed which gives new meanings to the dimensions of time and space on a changing world. It recognises by implication that the goal of a world commonwealth can be brought into sight and gives hope that the promise of a dream is not beyond fulfilment.

It was in this spirit that a Declaration of the Rights of Man was drafted a year ago and submitted to public discussion. Lord Sankey was the chairman of the committee which prepared this statement of rightful human claims and obligations, and Mr. Wells was the originator of it. The opening paragraphs of the introduction to the Declaration may be appropriately reproduced here because they state world conditions differing from those with which international politics have hitherto had to deal. The paragraphs read as follows:—

> "Within the space of little more than a hundred years there has been a complete revolution in the material conditions of human life. Invention and discovery have so changed the place and nature of communications round and about the earth that the distances which formerly kept the states and nations of mankind apart have now been practically abolished. At the same time there has been so gigantic an increase of mechanical power, and such a release of human energy, that man's ability either to co-operate with or to injure and oppress one another, and to consume, develop or waste the bounty of Nature has been exaggerated beyond all comparison with former times. This process of change has mounted swiftly and steadily in the past third of a century, and is now approaching a climax."
>
> "It becomes imperative to adjust man's life and institutions to the increasing dangers and opportunities of these new circumstances. He is being forced to organise co-operation among the medley of separate sovereign States which has hitherto served his political ends. At the same time, he finds it necessary to rescue his economic life from devastation by the immensely enhanced growth of profit-seeking business and finance. Political, economic and social collectivisation is being forced upon him. He responds to these new conditions blindly and with a great wastage of happiness and well-being."

The object of the Declaration was to assemble and proclaim fundamental and inalienable rights of man as a species living upon the planet Earth, and with powers of conquest over agencies—natural or social—which obstruct his advancement. Science and the humanities can meet on common ground in an endeavour to make a Charter of this kind represent elements which enter into human reactions and should be regarded almost as commandments for the guidance of international policies. When agreement has been reached upon the essential human needs and rights declared in such a Charter, a very promising nucleus will have been created upon which scientific and ethical principles can crystallize. Without a foundation of this kind, conciliation of conflicting interests, and political expediency, will determine the influence and actions of leagues, unions, councils and courts, and there will be no fixed star by which to shape the courses of ships in the stormy seas of international politics.

The Declaration of Lord Sankey's Committee was concerned mainly with the rights and duties of man in relation to the community in which he lives, whatever his position and wherever he may have his being. It comprises eleven clauses expressing these rights and obligations, the first of which reads:—

> "Every man is a joint inheritor of all the natural resources and of the powers, inventions, and possibilities accumulated by our forerunners. He is entitled, within the measure of these resources and without distinction of race, colour or professed beliefs or opinions, to the nourishment covering the medical care needed to realize his full possibilities of physical and mental development from birth to death."

Among other principles expressed in the Declaration as applying to all men, and

therefore to be borne in mind in deliberations affecting the world community are:—

> "It is the duty of every man, not only to respect, but also to uphold and to advance the rights of all other men throughout the world."
>
> "Every man has a right to the utmost freedom of expression, discussion, association and worship."
>
> "The fount of legislation in a free world is the whole people, and since life flows on constantly to new citizens, no generation can, in whole or in part, surrender or delegate this legislative power, inalienably inherent in mankind."

Since the outbreak of the conflict in which all peoples of the world are now directly or indirectly involved, many declarations have been made of principles expressing the needs and aims of all men. They all have much in common, and from them it should be possible to construct fixed standards in which the rights of nations are given international values and the welfare of the whole community of mankind is the concern of international politics. However far distant we may be from the effective application of such basic principles, conditions of life to-day demand the formulation, by common consent, of a charter in which all communities will have world rights, relationships, and responsibilities. There can be no unified political, economic and social order unless schemes of reconstruction are conceived in this spirit, with full knowledge of the primitive instincts of man and the lag between them and the powers which science have given him.

The three chief principles of inter-State intercourse, on which international law is based, are said with authority to be:—

(1) Recognition of each other's existence and integrity as States.

(2) Recognition of each other's independence.

(3) Recognition of equality, one with another, of all independent States.

International law may narrate these principles, but international politics have made a mockery of them. A bewildered world finds itself deprived of all these "recognitions", and seeks new fundamental truths to satisfy its outlook. The so-called laws of Nature are only generalisations which have to be revised when cases not covered by them are brought before the court of science. International politics has to adopt a similar attitude towards the evidence presented to it, and international statutes should not be limited to the relationships of one sovereign State to another, but of every State to all others.

In the realm of the humanities, as in that of the natural sciences, the closer the approach of a principle to fundamental truth, the longer will it survive. All peoples of the world have certain attributes in common, and all high religions, teach the observance of certain ethical principles. When these principles have been collated and analysed, a sound basis will be secured for the constitution and judgments of a court of international politics, and the goal of world unity will come into view. Science can usefully combine with politics to attain this end.—SIR RICHARD GREGORY, BT., F.R.S.

[*From an address given at a meeting at Chatham House on Tuesday, February 3rd,* 1942.]

HEAVY CHEMICAL INDUSTRIES IN INDIA*

BY
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YET, another Committee, this time of an exploratory character, is all the help which those who are interested in the development of heavy chemical industries in India have received from the Government of India.

The first Great War of 1914–18 revealed to everybody interested in the subject the utterly backward state of chemical industries in India. In fact there were no chemical industries worth the name throughout the length and breadth of this sub-continent. A factory at Ranipet in South India, one in Bombay and one at Cawnpore—all three owned by British interests—and another small one at Calcutta owned by an Indian firm were manufacturing small quantities of sulphuric acid and some common sulphates. These constituted the sum and substance of achievements in India at that time in the field of chemical industries. To rectify the industrial deficiencies of India, the Indian Munition Board was constituted with a geologist at its head. The Board produced a handbook called the Indian Munitions Handbook, which was published in 1917. A few items of meagre statistics that were available were reproduced. Much was said about the possibilities of heavy chemical industries in India by Professors with academic distinctions. Beyond affording some head lines for the daily press, to focus the attention of the public about the industrial deficiencies in India, to wit, in the field of chemical industries, no steps were taken to actually start new factories in India to produce the chemicals required. After a great deal of agitation, the Indian Industries Commission was appointed and produced a bulky report which was acclaimed in the press as solving all the difficulties in India in the field of industrial development. One of its main recommendations was the appointment of Directors of Industries and Commerce all over India. With characteristic alacrity and promptitude these Departments were created. The achievements of these Departments of Industries all over India are well known to be detailed here. The claims of heavy chemical industries were unheeded. Probably there was good reason for this. During the first post-war period, chemicals poured into India from all the belligerent countries even including Japan at cheap rates and whenever any industrialist thought of starting a chemical industry, the ever-present bogie of competition from abroad unnerved him and deterred him from taking even reasonable chances and risks. The dearth of qualified industrial chemists and technologists added to the difficulty. Indian capitalists had at every stage to depend on foreign experts and advice. The third difficulty was the lack of competent engineering firms who could undertake to manufacture the requisite machinery and equipment as per standard designs. The initial cost of equipment to be obtained from abroad was so high that interest and depreciation charges would impose a heavy strain on the cost of production. The lack of trained routine operatives was another difficulty. In spite of repeated requests by the members in the Legislative Assemblies and regular agitation in the public press, the purchasing Department of Government of India did not insist upon training being given to Indians in factories which regularly received handsome and lucrative patronage. Indian chemists and engineers found it more and more difficult to get any kind of training in British factories. The same was the experience in other continental countries and America. Indians were declined admission to factories even as visitors. The position became intolerable and comments in the public press became insistent. Half a dozen or so of the Indian firms who were struggling to maintain the existing heavy chemical industries in India were threatened with extinction due to foreign competition—in this case mainly from England. The result was the Government of India referred the question of protection to heavy chemical industries in India to the Tariff Board. As usual after wandering all over India, the members of the Tariff Board

* The views expressed in this article do not represent those of the Department of Industries and Commerce, Mysore.

produced a report in 1930. This report continues to be an ornament on the book shelves of libraries all over India. The Government of India did not take any steps which could have afforded even the slightest relief to Indian manufacturers.

The unique example of the difficulties enumerated above faced the Dhrangadhra State in Kathiawar where it was proposed to manufacture soda ash. Undaunted by the difficulties enumerated above, nearly a crore of rupees was poured into this industry, impoverishing the resources of the small State to no inconsiderable extent and at that stage the only thing that could have saved the industry was "Protection" and this was not granted.

Even though it does not strictly pertain to the subject-matter of this article, about the same time, on account of continued agitation in the press, the Drug Enquiry Committee was appointed which produced a valuable report on which partial action was taken and legislative measures were introduced ten years later. The heavy chemical industry did not receive even this amount of recognition. Another great world war showed the pitiable condition of India in the field of heavy chemical industries. The Government of India have appointed an Exploratory Committee!

Convention requires that the term heavy chemical industries should include only the common mineral acids, soda ash, caustic soda and other alkali products together with a few heavy sulphates. Whatever may have been the justification in the past for restricting the use of the term to refer to only these products, the term now-a-days connotes other industries also. Many of the industries which in turn use these basic chemicals also come under the category of heavy chemical industries like distillation of coal tar and production of certain derivatives; manufacture of glass, paper and soap; manufacture of rayon; manufacture of industrial solvents by bio-chemical processes; the fixation of nitrogen with all the ramifications of synthetic ammonia industry; electro-chemical industries like the manufacture of aluminium, calcium carbide and their derived products. Last of all, but probably the most important in the series in the matter of national self-sufficiency comes the manufacture of modern explosives. The list may be added to. Small beginnings in some of these industries have already been made and it is hoped that in years to come these will be afforded adequate protection for expansion and development. The weakest part in this programme is the practical absence of the manufacture of chemicals or chemical products required by the Defence Department of Government of India. One or two Government-controlled factories manufacture small quantities of explosives but as compared with the national demands it is a drop in the ocean. There is an enormous field for expansion of this industry which in turn will give an impetus to the manufacture of the necessary heavy chemicals in practically every branch. It is of course stated that any Tom, Dick and Harry cannot be entrusted with the manufacture of explosives. But under suitable secrecy and protection private Indian capitalists should be encouraged to undertake these manufactures. The necessary corollary of the development of chemical industries required by Defence Department is the development of engineering industries which are equally necessary. Other competent leaders in India are taking adequate steps to focus the public attention to these problems and they have also brought the matter to the notice of the Government of India.

A handicap in India, at all events in South India, for the development of heavy chemical industries is the lack of cheap coal and also the lack of sulphur. Abundant and sufficiently dependable supplies of pure lime is another drawback. Even though phosphates are found in Trichinopoly District the grade is poor. Even though extensive deposits of bauxite are available in South India, they are not pure enough for the manufacture of aluminium unless preceded by costly purification processes. Many of the important mineral raw materials will have to be imported from abroad. This may not deter us since every advanced country is obtaining raw materials from great distances. Since India does not own a sufficiently big fleet of merchantmen receiving handsome private subsidies from Government, the cost of minerals and raw materials brought to India from abroad may be heavier on account of heavier freight charges. As mentioned earlier in this article, for some time to come, we may have to import special equipment from abroad at high prices. With all these drawbacks and difficulties, it is still possible to start a

number of factories specialising in the manufacture of heavy chemicals in South India. Regarding the electric power it is simply a question of Government making up their minds to give power at not more than Rs. 50 to Rs. 60 per Kilowatt year even though they may be able to obtain a higher revenue by selling electricity to factories where no electro-chemical process is involved.

The situation is one full of anxiety and also hope. The anxiety is due to difficulties enumerated above. The hope is centred in another hope, *viz.*, that at no distant future there is bound to be a national Government with national outlook which will necessarily look to national self-sufficiency from the point of view of national existence and national defence.

RADIO FADE-OUTS IN FEBRUARY AND MARCH, 1942

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RADIO fade-outs of the Dellinger type were experienced on a number of occasions during the period 21st February to 23rd March 1942. The times and dates of occurrence of the fade-outs are given below. The particulars given are based on the observations made at the A.I.R. Receiving Centres situated at various places in India:—

Date	Observing Station	Time of commencement of fade-out I.S.T.	Time when revival to normal conditions commenced I.S.T.	Time when conditions became normal I.S.T.	Remarks as to intensity of fade-out, etc.
21-2-1942	Delhi	19·10	19·25	20·00–22·00	On Western stations only (severe)
,,	Trichinopoly	18·55	19·40	..	do
28-2-1942	Delhi	17·30	18·15	20·00–22·00	Complete fade-out of all stations. Even medium wave stations became poor
,,	Bombay	17·30	17·51	20·00; almost back to normal	do
,,	Calcutta	17·30	17·40	..	do
,,	Madras	17·32	17·58	..	do
,,	Trichinopoly	17·30	17·45	18·15; Indian stations normal. Western stations normal only at 22·00	do
,,	Lucknow	17·30	17·55	do	do
3-3-1942	Delhi	17·00	17·10	18·00	Severe fade-out
,,	Bombay	16·55	17·00	..	Partial fade-out
,,	Calcutta	about 16·30	..	..	Partial fade-out
,,	Madras	16·50	17·15	..	Partial fade-out
4-3-1942	Bombay	12·12	12·23	13·00	Severe fade-out
,,	Calcutta	12·05	12·23	..	do
,,	Trichinopoly	12·07	12·20	..	do
,,	Lucknow	about 12·15	..	..	..
7-3-1942	Delhi	10·30	11·20	13·00	Severe fade-out
,,	Calcutta	11·00	12·20	..	do
,,	Madras	about 11·30	12·00	..	..
,,	Trichinopoly	11·30	12·00	..	Severe fade-out
,,	Lucknow	Earlier than 12·00	about 12·00	13·00	Observations made only after the fade-out started
23-3-1942	Delhi	08·10	..	..	Partial fade-out. Eastern stations affected

The differences in the times given by the various stations for the commencement of the fade-outs appear mainly to be due to the sudden and unexpected nature of the phenomenon. The times when conditions returned to normal are very approximate in view of the varying duration of the fade-outs on different frequencies and on different transmitting stations.

While it is not possible to give in detail, the large quantity of observational material that has been collected by the various A.I.R. stations during these fade-out periods, it can be said that, in general, the observations conform with the published characteristics of the Dellinger type of fade-out.[1] It may be mentioned here in particular that during the fade-out on the evening of the 28th February 1942, the signal strength of medium wave stations (550 kc./s. to 1500 kc./s.) also decreased very considerably. This fact is in support of similar observations made by the National Bureau of Standards of America.[2]

Pulse observations made with a multi-frequency pulse generator installed at the main receiving centre at Todapur near Delhi, show that up to the commencement of the fade-outs normal reflections were obtained in the usual manner. During the periods of intense fade-out, however, no trace of any reflections could be observed throughout the continuous range of frequencies tried, namely, 4 to 13 Mc./s. The measured critical frequency of the F_2 layer before and after the fade-outs had not altered to any extent other than what is to be expected from the passage of time. The minimum virtual heights of the F_2 layer also had not undergone any appreciable change.

It is interesting to note that such radio fade-outs, so far as observations made in India since 1939 indicate, have been found to occur mostly round about the equinoctial period, *i.e.*, March and September and sometimes in the last week of February and in the first week of April. The dates on which these fade-outs have been observed by A.I.R. stations since 1939 are given below in support of the above statement:—

Date	Time of commencement I.S.T.	Remarks
29th April 1939	13·00 Hours	Complete fade-out
14th Sept. 1939	12·00 ,,	Complete fade-out
25th ,, 1939	13·30 ,,	Partial fade-out
21st March 1940	08·48 ,,	Complete fade-out
23rd ,, 1940	16·50 ,,	Complete fade-out
30th ,, 1940	11·30 ,,	Partial fade-out
3rd ,, 1941	14·00 ,,	Complete fade-out (severe magnetic storm on 1st March 1941)
17th Sept. 1941	13·59 ,,	Complete fade-out
18th ,, 1941	08·00 ,,	Complete fade-out (severe magnetic storm on 17th and 18th September 1941)
21st Feb. 1942	18·55 ,,	Severe on Western stations only
28th ,, 1942	17·30 ,,	Severe
3rd March 1942	16·55 ,,	Severe
4th ,, 1942	12·07 ,,	Severe
7th ,, 1942	about 10·30 hours	Severe
23rd ,, 1942	08·10 hours	Partial

It will be seen that excepting for the first mentioned fade-out on 29th April 1939, all the other observed fade-outs in India since 1939 have occurred during the equinoctial period.

[1] Dellinger, *P.I.R.E.*, October 1937, pp. 1253-1294.

[2] National Bureau of Standards (*P.I.R.E.*, October 1940, p. 486).

LETTERS TO THE EDITOR

THIAZOLE DERIVATIVES OF SULPHANILAMIDE IN MONKEY MALARIA

Certain sulphonamides like sulphanilamide, sulphapyridine and sulphathiazole have been shown to possess a curative property against experimental malarial infections in monkeys (See Dikshit and Ganapathi).[1] The author has tried two new thiazole derivatives of sulphanilamide (i) 2-N^1-sulphanilamido-5-ethylthiazole and (ii) N^1-methyl-sulphathiazole in several infections, bacterial and protozoal, including malarial infection in monkeys. The present note is concerned only about the malarial infection. The drugs were prepared by Ganapathi *et al.*[2] in the Chemotherapy Department of the Haffkine Institute and supplied by that department.

Rhesus monkeys infected with *Plasmodium Knowlesi* were used for the purpose. When the infection had reached a moderate degree (about 10 parasites per 10,000 R.B.Cs.) the drugs were administered orally by a stomach tube. The dose administered was 1 gm. twice a day for 3 consecutive days. It was found that after administration of these drugs the parasites disappeared completely from the peripheral blood in 4 days. It was further observed that there was no relapse in the monkeys treated with these drugs while controls similarly treated with atebrine showed a relapse. The question of a radical cure was therefore investigated in the case of animals treated with 2-N^1-sulphanilamido-5-ethylthiazole. It was found that the blood of animals treated with this drug was not infective to normal animals 20 days after the disappearance of the parasites from the peripheral blood and the animals so treated were as susceptible to fresh infection as normal animals. It was therefore concluded that 2-N^1-sulphanilamido-5-ethylthiazole produces a radical cure in Rhesus monkeys infected with *P. knowlesi*. Cure of *knowlesi* infection in monkeys does not necessarily mean that the drug will be effective in human malaria also and investigations on this point along with the pharmacological investigations are being undertaken.

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May 5, 1942.

[1] Dikshit, B. B., and Ganapathi, K., *J. Mal. Inst. Ind.* 1940, **3**, 525.

[2] Ganapathi, K., Shirsat, M. V., and Deliwala, C. V., *Proc. Ind. Acad. Sci.*, 1941, **14A**, 630.

CURRENT DENSITY AT THE CATHODE OF A GLOW DISCHARGE THROUGH GASES

A METHOD, which consists in rotating a fine hole bored in a cylinder closely fitting into the cathode, has been devised for determining the current density at different points of the electrode. This method is free from the objections which usually accompany the investigations with a "split cathode". The experiments were carried out with plane parallel circular electrodes over a pressure range of 0·33 — 0·02 mm. Hg, voltage range of 365–2990 volts and a current range of 0·25 — 9·5 m. amps.

It has been found that under all conditions of the discharge examined, there is a certain area of the cathode, always the central portion of it, over which the current density is uniform. This area, though mainly dependent on the pressure, shows a slight tendency to decrease with increase of voltage and current at a constant pressure. At low pressures the current density falls off rapidly towards the edges beyond this area and in most cases there is no current at all on the outermost zone of the cathode. The area of the inactive portion of the cathode is also found to be a function of the discharge pressure. At high pressures the current density is uniform over almost the entire surface of the cathode. Figs. 1 and 2 show the current density at the cathode at low and high discharge pressures respectively.

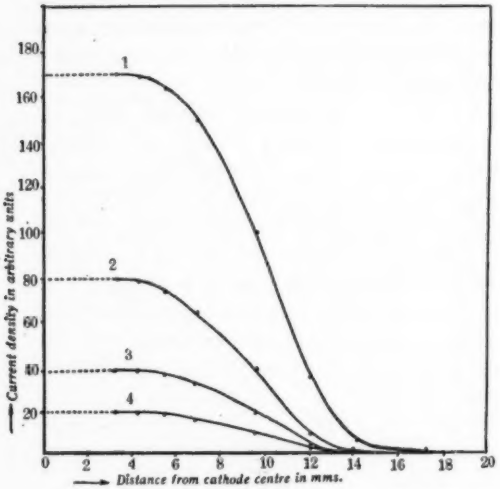


FIG. 1

Gas = Air
Discharge pressure = $1{\cdot}83 \times 10^{-2}$ mm. Hg.
Curve 1 Discharge Volts = 2990
" Current = 1·75—1·70 m.a.
" 2 Discharge Volts = 2215
" Current = 1·0 m.a.
" 3 Discharge Volts = 1775
" Current = 0·75 m.a.
" 4 Discharge Volts = 1250
" Current = 0·25 m.a.

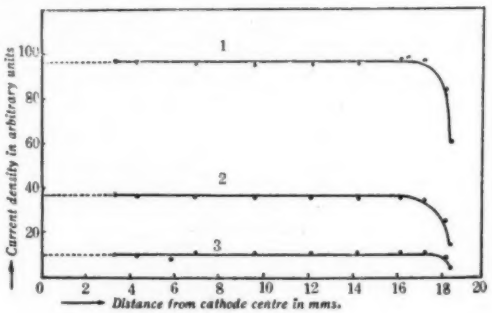


FIG. 2

Gas = Air
Discharge pressure = $1{\cdot}43 \times 10^{-1}$ mm. Hg.
Curve 1 Discharge Volts = 620
" Current = 8·0 m.a.
" 2 Discharge Volts = 500
" Current = 3·3 m.a.
" 3 Discharge Volts = 420
" Current = 1·6 m.a.

It is also observed that the Aston's relation, $V = E + \frac{F\sqrt{C}}{P}$, derived from experiments performed at much higher pressures than in the present case, holds good at low pressures as well, where the discharge is strongly "abnormal" and the cathode is not fully covered with the discharge. Fig. 3 shows a relation between V and C, the discharge voltage and current density respectively.

Experiments were also performed with a cathode consisting of several annular rings. The current density over any ring was always found to be greater than over its neighbour towards the edge of the cathode. These observations were confined to comparatively low pressures only, as at higher values the discharge strikes at the back of the rings.

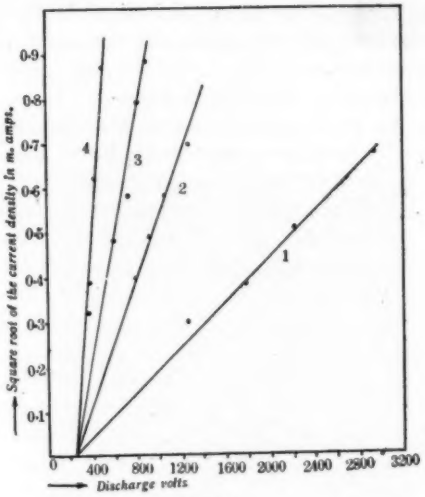


FIG. 3

Gas = Air

Curve 1	Pressure	$= 1{\cdot}83 \times 10^{-2}$	mm. Hg.
,, 2	,,	$= 5{\cdot}07 \times 10^{-2}$	,,
,, 3	,,	$= 9{\cdot}24 \times 10^{-2}$	,,
,, 4	,,	$= 2{\cdot}49 \times 10^{-1}$	,,

Investigations with a cathode perforated with fine holes of equal size at different points were not found satisfactory to give the average current density at the cathode.

Details of the experiments will be published elsewhere.

RAFI MOHAMMED CHAUDHURI.
MOHD. ABDUL BAAQUI.

Department of Physics,
Aligarh,
Muslim University,
April 21, 1942.

VITAMIN D AND OTHER PRODUCTS OF METABOLISM FROM YEAST

AN examination of yeast deposited during the alcoholic fermentation of molasses revealed the presence in it of substances which may indicate the mechanism of its growth and action.

An alcoholic extract of the yeast yielded a light green 'oil' with a characteristic yeast odour. The liquid has a specific gravity, 0·95 to 1·1, refractive index 30° C. = 1·475, congeals at − 17° C. A small quantity of a red oil collecting below the greenish oil, has sp. gr. 30° C. = ·952, $n_D^{30} = 1{\cdot}494$ and deposits crystals which recrystallised from acetone melt at 130°–140° C. From the supernatant greenish oil are deposited crystals with a m.p. = 155°–160° C.

The yeast oil is separated into an acetone soluble green liquid of $d = 1{\cdot}07$, $n_D = 1{\cdot}476$ and an acetone-insoluble brown liquid of $d = 1{\cdot}18$ and $n_D = 1{\cdot}468$. Three or more water-soluble acids of high molecular weight, with a pleasant smell are found in the acetone soluble liquid. A pale yellow, unsaturated acid, $n_D = 1{\cdot}439$, soluble in ether, reduces $KMnO_4$ and $AgNO_3$ solutions, decolourises bromine water, its alkaline solution is oxidised and turns black in air; with $FeCl_3$ solution a green blue colour appears and it has a neutralisation equivalent of 135. A second acid, ether soluble, crystallises in rhombic plates or as a cluster of needles seen under the microscope, with a m.p. = 178–180° C. Another acid is a brown liquid, insoluble in ether, soluble in alcohol, $n_D = 1{\cdot}468$, with a neutralisation equivalent of 290. Another black, powdery acid is insoluble in water and ether, soluble in alcohol, its alkaline solution turns dark in air, like that of pyrogallol.

The neutral oil, on saponification, gives rise to an acidic component, a pale yellow liquid, $n_D = 1{\cdot}459$, insoluble in water and separated into an ether-soluble acid $n_D = 1{\cdot}445$ and an ether-insoluble acid, $n_D = 1{\cdot}423$ with a neutralisation equivalent of 274.

From the unsaponifiable and neutral liquid, pale yellow crystals deposit and recrystallised from acetone have a m.p. = 115–120° C. The mother liquor, $n_D = 1{\cdot}499$, has a bright orange-yellow colour and a characteristic pungent smell. The liquid consists largely of ergosterol (Vitamin D) as estimated by spectrographic and gravimetric methods. (Courtesy of Mr. M. Sreenivasaya, Indian Institute of Science, Bangalore.)

Further identification and quantitative determinations are in progress.

Y. K. RAGHUNATHA RAO.
Mysore Sugar Co.,
Mandya,
March 12, 1942.

PRETREATMENT OF COTTON SEED WITH AMMONIUM SULPHATE

PLACEMENT of fertilizers appears to be an important factor governing the response of a crop to fertilizer application.

In the case of cotton, the usual methods of applying Ammonium Sulphate at the time of sowing are (i) drilling the seed first and dropping the fertilizer by hand later in the opened out furrows and finally covering them up or (ii) drilling the fertilizer with dry seed itself.

A still more convenient method would appear to be to sow the cotton seed coated with Ammonium Sulphate. The coating with Ammonium Sulphate is best done when the seed in a slightly moist state, after treating it with earth and dung paste, is mixed up with dry Ammonium Sulphate. Maximum amount of Ammonium Sulphate that can be coated round the seed depends upon the variety having a big or small size seed and the seed rate used. In the case of V. 434 cotton seed it is estimated that Ammonium Sulphate equivalent to 20 lbs. of Nitrogen can be coated round it, the seed rate being 20 lbs. per acre. The number of seeds per gramme weight is 14·69 in the case of V. 434 cotton.

An experiment was conducted on the Seed and Demonstration Farm, Khandwa (Nimar), during 1941–42. Nitrogen applied was at the rate of 10 lbs. per acre, in the form of Ammonium Sulphate. Mean yield of kapas obtained was as shown in the table below. The experiment was of a randomised block type, with five replications, the plot size being 1/40th of an acre.

Mean yield in lbs.

Yield	Treatment				Mean	S.E.
	Coated	Topdressed	Half drilled with dry seed and half top-dressed	Control		
1	2	3	4	5	6	7
Per acre .	644·0	443·2	456·8	387·2	482·8	31·72
Per cent. of mean .	133·8	91·8	94·6	80·2	100·0	6·57
Per cent. of control ..	166·3	114·5	118·0	100·	—	—

Important observations are:—

(i) Application of fertilizer at the time of sowing appears to be better than applying it as a top dressing.

(ii) The best way of applying the fertilizer at the time of sowing is to coat it round the seed before sowing. The increase in yield obtained by this method is over 66% above the control, the increase which is not usually obtained even by higher application of over 40 lbs. of nitrogen per acre in the usual manner. Coating with Ammonium Sulphate is best done when the seed, in a slightly moist state after treating it with earth and dung paste, is mixed up with dry Ammonium Sulphate.

(iii) The treated plots are earlier to mature and have a better bearing and larger size of bolls; those in which the seed is coated are the earliest to mature.

The results will be discussed in full elsewhere. Further work is in progress.

R. J. KALAMKAR.

Department of Agriculture,
Jubbulpore, C.P.,
April 9, 1942.

METALLOGRAPHY OF INDO-GREEK BRONZE COINS FROM TAXILA

THROUGH a chemical and metallographic analysis and *Diamond Hardness* of the Indo-Greek coins from Taxila, an attempt is being made to reconstruct the system of ancient Indian Coinage and to trace the sources of the metals employed. One of the interesting minor results of these investigations confirms and is confirmed by Prof. Birbal Sahni's conclusions regarding the minting of ancient Indian coins at Rohtak.

In 1936 Prof. Birbal Sahni, F.R.S., discovered a number of coin moulds used by the Yaudheyas[1] (Ca. 100 B.C.) in certain mounds at Kokra Kot in the immediate vicinity of Rohtak (Long.

76° 35′ E, Lat. 28° 54′ N) in the Punjab. This discovery enabled him to reconstruct the technique employed by the Yaudheya mint masters. It is not unlikely that the same technique has been employed in other ancient mints as well.

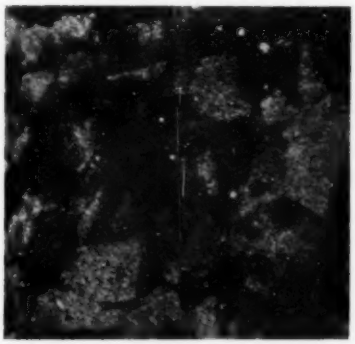


FIG. 1

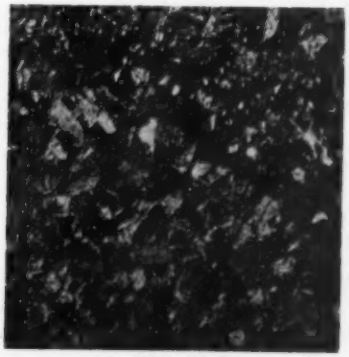


FIG. 2

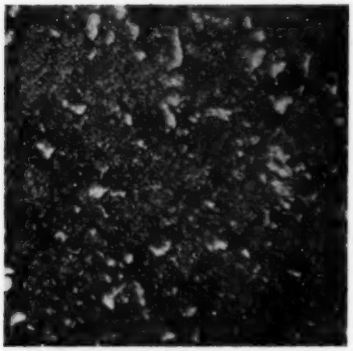


FIG. 3

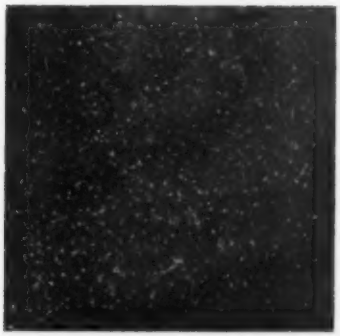


FIG. 4

Figs. 1–4. Etched with acid Ferric chloride. × 100.

Molten alloy is poured into the complex mould system reconstructed by Prof. Sahni in which the moulds are arranged one over the other. If the alloy is allowed to cool of itself through the critical temperature, the central moulds in the system are kept hot by the molten or hot alloy in the top and bottom tiers of moulds. Thus the central moulds cool slowly. On the other hand, the moulds at the bottom and at the top cool more rapidly. Hence the coins in the different layers of moulds must show variations in the metallographic structures. Remembering that the cooled alloy is a system of polygonal grain boundaries representing crystal grains which constitute the mass of the metal, one finds large grains in the coins of the central moulds. The coins in the top and bottom layers of moulds show grains which are structureless and almost amorphous through rapid cooling. In the latter case the molten metal has had no time to crystallise. Between these two extreme limits, there are structures showing different grain sizes and of grains in the making.

The mechanism of minting reconstructed by Prof. Sahni was verified in the case of Indo-Greek bronze coins[2] (Ca 250 B.C.-60 A.D.) from Taxila (Long. 72° 50′, Lat. 33° 40′)—a region not far away from Rhoṭak. Microphotographs of about 120 coins were taken. The metallographic structures of these coins grouped

themselves under four broad divisions which are illustrated below. Fig. 1 shows large crystals and represents the metallographic structure induced by a slow cooling of the alloy. Fig. 2 shows the structures of a more rapid cooling alloy. The crystals are smaller in size. Further growth has been suppressed as a result of quick cooling. The coins were probably from moulds between the central and the top or bottom tiers of moulds. Fig. 3 shows the structure when the rate of cooling is higher than that for (1) and (2), probably of coins in moulds nearer the top or the bottom tiers than the central ones. There are only a few small crystals in a groundmass of amorphous precipitations. Fig. 4 shows the structure when the cooling is still more rapid, such as of moulds at the top or bottom of the system and consists entirely of precipitation.

Thus the metallographic structures broadly fit in with the reconstruction suggested by Prof. Sahni. These metallographic structures can be explained somewhat differently—at least so far as the Indo-Greek coins are concerned. If the mould containing the molten alloy is covered with earth or such other non-conducting material or if some process of annealing is employed, the rate of cooling will be slow, resulting in large grain size such as is illustrated in Fig. 1. The coins being very thin (2-3 m.m. in thickness), the slow cooling should have been purposely effected. Otherwise the appearance of large grains is inexplicable. On the other hand, if the molten metal is suddenly dipped into a liquid or normalised, the structure shows minute precipitation as in Fig. 4 without any crystalline structure. Between these extreme limits, Figs. 2 and 3 illustrate the structures when the molten metal neither cools so slowly as in (1) nor so rapidly as in (4). Probably air cooling or cooling with a wet mould was employed in such cases.

It is interesting to note that the crystals do not show any twinning or elongation. The absence of such deformation is another clear indication that the Indo-Greek coins have not been die-stamped as modern coins are, but cast in moulds.

S. PARAMASIVAN.

Government Museum,
Madras,
April 8, 1942.

[1] B. Sahni, *Current Science*, 1935-36, **4**, 796.

[2] The author is indebted to Rao Bahadur K. N. Dikshit, Director-General of Archæology in India for these coins.

ON THE OCCURRENCE OF PARGASITE IN MYSORE

LAST year was published in the *Mysore University Journal*[1] a comprehensive account of the optical characters of some "Blue amphiboles" in the Mysore State; and from such optical characters, it was deduced that their chemical composition could be expressed as a mixture of the Pargasite, Common Hornblende and Glaucophane molecules. It was also deduced that an increase of Soda and Ferric content, denoted intenser pleochroism and higher birefringence.

One of these Blue ambhiboles, collected among the Ultrabasic rocks of the Mysore District, has been kindly analysed by Mr. M. Sesha Iyengar, and his colleagues, Mr. G. Narayan and Dr. M. R. Aswathanarayana Rao. For comparison are set below analyses of Pargasite and Hornblende.[2]

	Blue Amphibole	Pargasite	Hornblende
SiO_2 ..	46·89	41·26	39·80
Al_2O_3 ..	11·86	11·92	14·28
FeO ..	12·08	9·92	19·02
Fe_2O_3 ..	1·96	4·83	2·56
CaO ..	10·81	11·95	10·73
MgO ..	11·91	13·49	9·10
Na_2O ..	3·05	1·44	1·79
K_2O ..	0·15	2·70	2·85
H_2O ..	0·70	0·52	1·42

The above results show the approximation of the Blue amphibole under study to Pargasite rather than to Hornblende.

A. N. Winchell[3] has opined that the amphiboles, like the pyroxenes, should be regarded not as mixtures of oxides, but as a mixture of silicate molecules, having the general formula $R\,R'\,R''_3$, *i.e.*, metasilicates of the type of $MgSiO_3$, $FeSiO_3$, H_2SiO_3, $CaMgSi_2O_6$, $CaFeSi_2O_6$, (Na, K) $FeSiO_2O_6$, (Na, K) $AlSi_2O_6$, $AlAlO_3$, $FeFeO_3$.

Recasting the above chemical analysis in terms of these molecules, the Mysore Amphibole has the formula,

$$2CaMgSi_2O_6 \cdot MgSiO_3,\ (Na, K)\ AlSi_2O_6 \cdot 2(Fe, H_2)SiO_3 \cdot (Na, K)\ FeSi_2O_6 \cdot AlAlO_3.$$

The percentage of these molecules occurring in the "Blue amphibole" under study are calculated, and set for comparison with two of Winchell's studies as also with that of a Hornblende:

	Blue Amphibole	Pargasite		Hornblende
		I	II	
$CaMgSi_2O_6$ ..	28·30	47·18	34·61	29·38
$MgSiO_3$ ..	15·09	31·06	17·73	15·13
$FeSiO_3$ ..	29·53	·31	14·03	10·78
H_2SiO_3 ..	11·32	..	..	..
(Na, K) $FeSi_2O_6$	1·89	1·21	·77	..
(Na, K) $AlSi_2O_6$	15·09	..	..	..
$AlAlO_3$ ..	9·43	..	7·50	7·67
$FeFeO_3$ ..	..	..	1·33	7·25
(Na, K) AlO $(F{\cdot}OH)_2$ ..	..	18·84	11·62	11·21
$CaFeSi_2O_6$.	..	2·25	13·03	19·86
	Mysore	Grenville	Finnland	Mt.Somma

The molecular affinities of the Blue amphibole are with Pargasite rather than with Hornblende. The Mysore Pargasite differs from the Finnland Pargasite, in the fact that the glaucophane molecule replaces the $CaFeSi_2O_6$ molecule in the latter.

This chemical study, therefore,—the location of the glaucophane molecule,—confirms the chemical deductions forecast by optical studies.[4] Such concordance between chemical composition and optical characters is, according to Winchell, a fairly constant feature of amphiboles, which have an alumina tenor of 10 to 15 per cent., and a Ca : Mg + Fe ratio of about 1 : 2. It will be seen in the Mysore Pargasite that the alumina is 9·43 per cent., and the Ca : Mg + Fe ratio is 15Ca : 23Mg + 13Fe, which is roughly about 1 : 2. The optical characters of the Mysore Pargasite are set hereunder, alongside the characters of the Finnland Pargasite.[5]

Pargas. Finnland	*Mysore*
$Z \wedge c = +26°$	$Z \wedge c = +18°$
− ve	− ve
$\gamma - \alpha = \cdot019$	$\gamma - \alpha = \cdot021$ (by Berek's Compensator)
$2V = 63°$	$2V = 64°$ (by the Mallard Constant Method)
Pleochroism	
X = Greenish-yellow	Yellow
Y = Emerald-green	Greenish-yellow
Z = Greenish-blue	Indigo-blue.

The agreement in optical characters between the Finnland and Mysore Pargasite, is fairly good. The appearance of the glaucophane molecule, in the Mysore Pargasite, gives it an intenser pleochroism.

P. R. J. Naidu.

Department of Geology,
Central College,
Bangalore,
April 15, 1942.

[1] *Mysore University Journal*, **1**, Part 18, 159-70.
[2] Van Horn, *General and Special Mineralogy*, p. 556.
[3] *American Journal of Science*, **8**, 292.
[4] *Mysore University Journal*, *Op. cit.*
[5] Dana's *Text-Book of Mineralogy*, 4th Edition, p. 575.

CHROMOSOME COUNTS IN THE SUGARCANE AND ITS HYBRIDS

ONE of the major handicaps associated with cytogenetic studies in the sugarcane is the very large number of chromosomes, particularly in recent seedlings where this number is known to reach as many as 164. One contributory factor to such large numbers is the doubling of chromosomes in one of the parents during megasporogenesis, while a second is the polyploid nature of most cultivated sugarcanes. These large numbers render the countings somewhat uncertain—particularly in the somatic phase—with the result that certain investigators have recorded the number in somewhat vague terms as 106 to 108.

Constant improvement in technique is gradually introducing greater certainty into such counts and it would appear that certain of the previous countings might need revision. A few instances are mentioned here.

Janaki Ammal[1] in her study of different types of *Saccharum spontaneum* found the numbers to be multiples of 8, such as, $2n = 48, 56, 64, 72$

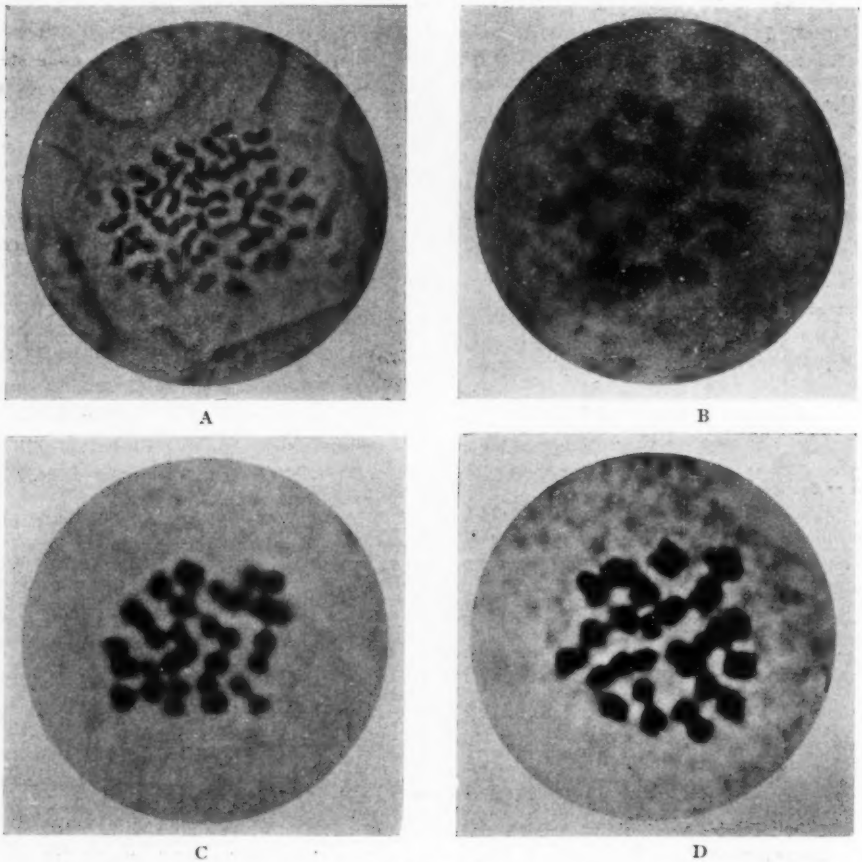
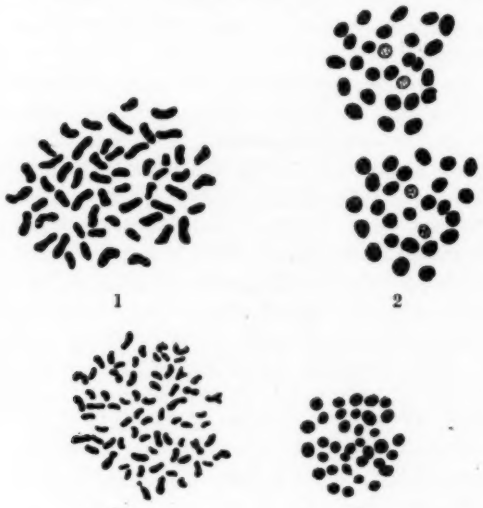


PLATE I

A. Somatic metaphase, *Saccharum spontaneum* (Lahore) × 2,500. $2n = 54$.
B. Polar view of metaphase I of *Saccharum spontaneum* (Bihar) × 3,500. $n = 30$.
C. do. $n = 30 + 1$ I.
D. do. (Dehra Dun) × 3,500. $n = 27$.

and so on. Subsequent work at Coimbatore is showing that one of the types of *Saccharum spontaneum* (the Lahore form) which was reported to contain $2n = 48$, is found to contain $2n = 54$ (Plate I A, Text-Fig. 1). This has been confirmed by the examination of a number of sections. Again, certain of the *Saccharum spontaneum* types obtained from Bihar have



Figs. 1-4 × 2500

1. Somatic metaphase *Saccharum spontaneum* (Lahore) $2n = 54$. (*cf.* Pl. I A)
2. Anaphase I (Dehra Dun) $n = 27$ (each group drawn separately).
3. Somatic metaphase *Bambusa arundinacea* $2n = 70$.
4. Metaphase I *Bambusa arundinacea* $n = 35$.

recorded varying numbers of chromosomes, such as, $n = 30$ and $n = 30$ plus 1 (univalent) (Plate I B and C). The form from Dehra Dun, which was reported to possess $n = 28$ by Janaki Ammal,[1] is found to possess $n = 27$ (Plate I D). This number has been confirmed by counting the chromosomes in the first division anaphase stage as well (Text-Fig. 2).

Similar discrepancies in counts have also been found in the genus *Bambusa* with which sugarcane has been crossed. *Bambusa arundinacea* has been examined both in mitosis and in meiosis and is found to contain $n = 35$ and $2n = 70$ (Text-Figs. 3 and 4) against $2n = 72$ recorded by other investigators.[2]

It would appear that in the case of sugarcane hybrids numbers alone may not be conclusive with regard to their parentages. Independent breeding tests to determine parental contributions, particularly on the mother side, are needed for indicating parentages with certainty. It is now well known that the number of chromosomes in sugarcane hybrids might either be the sum of the gametic numbers of the parents or the sum of the number in the male gamete *plus* twice the gametic number of the female parent. Recently, there is evidence to indicate that in certain male sterile sugarcanes, like P.O.J. 2725, seedlings may also arise through parthenogenesis, all of which show that mere numbers alone are not sufficient to indicate parentage with certainty.

T. S. Venkatraman.
N. Parthasarathy.

Imperial Sugarcane Station,
Coimbatore,
April 6, 1942.

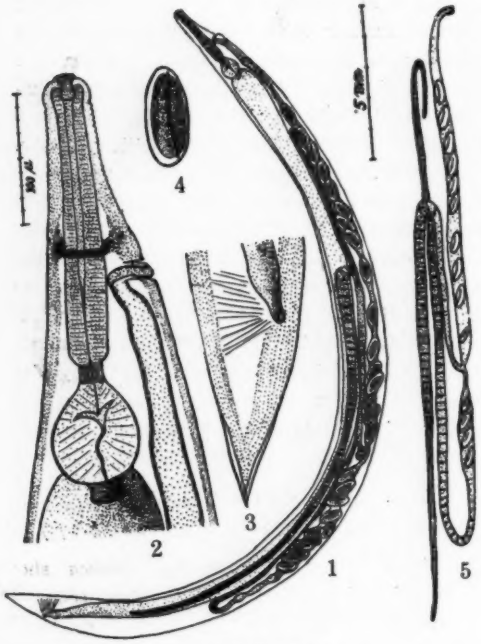
[1] Janaki Ammal, *Ind. J. Agri. Sci.*, 1936, **6**, 1.

[2] —, *Nature*, 1938, **141**, 925.
Uchikawa, I., *Imp. Bur. Pl. Genetics, Pl. Breed. Abs.*, 1936, **6**, 289.

PROTRELLINA PHYLLODROMI SP.NOV. A NEW NEMATODE PARASITE OF THE COCKROACH *PHYLLODROMIA HUMBERTIANA* SAUSS.

Recently the author had an opportunity of dissecting a few specimens of *Phyllodromia humbertiana* Sauss. Only one of them was found to carry nematode infection, and a single worm was recovered from the rectum of the infected cockroach. On examination it was found that the worm belongs to the family *Thelastmatidæ* Travassos 1929,[1] and to the subfamily *Protrelloidinæ* Chitwood 1932.[2] The worm represents a new species of the nematode genus *Protrellina* Chitwood 1932. The name

Protrellina phyllodromi is proposed for this species.



Protrellina phyllodromi sp. nov.

Fig. 1. Female, entire, lateral view.
2. Female, œsophageal region, lateral view.
3. Female, tail, lateral view.
4. Egg.
5. Female, reproductive organs.

Specific description.—Protrellina:

Male unknown.

Female 2·3 mm. long by 160 μ wide. Cuticle striated only anterior to vulva. First annule 22 μ wide, the following annules have a maximum width of 5 μ; the width of annules regularly decreases till striations are lost. Mouth surrounded by eight labiopapillæ. Buccal cavity cylindrical, 15 μ long by 10 μ wide. Œsophagus 300 μ long, consisting of an anterior corpus 210 μ long by 32 μ in maximum width, an isthmus not distinctly separated from the bulb, and a valvular bulb 65 μ wide. Nerve ring 130 μ from the anterior end of body. Excretory pore immediately in front of the vulva, 150 μ from the anterior end of body. Intestine with a slight anterior cardia. Anus 145 μ from the posterior end of body. Uterus bifurcating at one third of the body length from the posterior end, one branch is directed posteriorly and the other turns and is directed anteriorly; unbranched part of uterus 1·6 mm. long. Ovaries two, anterior ovary directed posteriorly and reflexed anteriorly, posterior ovary directed posteriorly but not reflexed. Eggs elongated elliptical, 75 μ long by 35 μ wide, without a crest, with two lateral grooves.

The species described in this paper resembles *Protrellina galebi*, but differs from the latter in the following characters. In *P. galebi* the adult worms are 5·5 to 7·8 mm. long while in *p. phyllodromi* the length is only about 2·3 mm. In *P. galebi* vulva is situated anterior to middle of œsophagus while in *P. phyllodromi* it is posterior to middle of œsophagus. The arrangement of reproductive organs in the two species is very different. In *P. galebi* the unbranched part of the uterus bifurcates near middle of body and in *P. phyllodromi* it bifurcates at about two-third of the body length from the anterior end. In *P. galebi* both the ovaries are directed anteriorly and are not reflexed while in *P. phyllodromi* both the ovaries are directed posteriorly, and the anterior ovary is reflexed.

Host.—Phyllodromia humbertiana Sauss.

Location.—Intestine (rectum).

Locality.—Aligarh (Northern India).

Type specimen.—Museum of the Zoological Laboratories, Muslim University, Aligarh.

For the purpose of differentiating the species at present included in the genus *Protrellina*, the following key is appended.

KEY TO THE SPECIES OF THE GENUS PROTRELLINA

1. Eggs not bearing cuticular crest .. 2
   Eggs bearing cuticular crest .. 3
2. Adult females about 2·3 mm. long *P. phyllodromi.*
   Adult females 5·5 to 7·8 mm. long *P. galebi.*
3. Eggs bearing cuticular bosses on crest, tail of female constricted *P. manni.*

Eggs apparently without bosses on crest, tail of female not constricted

P. australasiæ.

4. Vulva near base of œsophagus, œsophagus 633 μ long; eggs 130 to 180 μ long by 70 to 100 μ wide, with cuticular crest

P. künckeli.

Vulva anterior to and not near base of œsophagus, œsophagus 270 to 380 μ long; eggs 85 to 90 μ long by 36 to 41 μ wide, with cuticular crest *P. aurifluus.*

M. A. Basir.

Department of Zoology,
Muslim University, Aligarh,
April 8, 1942.

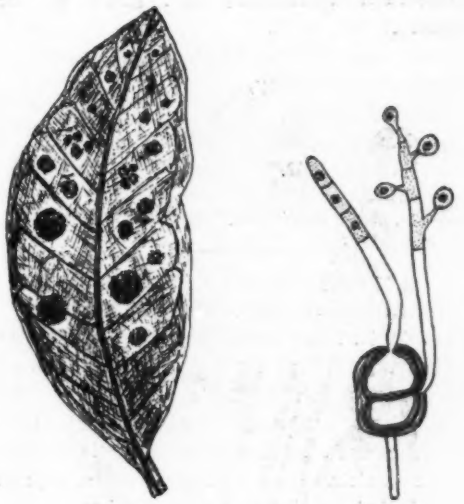
[1] Travassos, L., *Int. Oswaldo Cruz. Suppl.*, 1929, **5**, 15.
[2] Chitwood, B. G., *Zeit. Parasitenk.*, 1933, **5**, 1, 14.

A NEW SPECIES OF PUCCINIA ON *CHOMELIA ASIATICA* O.Kze.

During the course of the studies on some of the rust fungi of Mysore, the writer collected a rust on *Chomelia asiatica* (*Tarenna zeylanica* Gaertn. = *Webera corymbosa* Willd. = *Stylocoryna Webera* W. & A.) which has been found to be a new species of *Puccinia*, and the name *Puccinia Chomeliae* Thirumalachar is proposed.

The fungus attacks the leaves and twigs, forming cushion-like pustules (Fig. 1). Only the telial stage has so far been observed. Telia are subepidermal and soon become naked, the epidermis being cast off as a thin layer. Teliospores measure 35–38·8 × 25–30 μ, and are yellowish-brown, two-celled, pedicellate and slightly or not constricted at the septa (Fig. 2). The wall of the spore is thick, laminate and slightly hygroscopic, measuring 3·5 to 5 μ in thickness. The pedicels are 42–87 μ long.

Teliospores germinate within 24 hours without a resting period. The two cells of the spores each develop promycelia, on which are borne spherical thin-walled sporidia measuring 12 by 7 μ.



1 2

1. Infected leaf *Chomelia asiatica* O. Kze.
2. Germinating teliospore × 400.

The Puccinia on *Chomelia asiatica* shows close resemblance to *Puccinia pentanisiae* Cke. on *Pentanisia mirablis* Harv. (Cooke, 1882), another member of the *Rubiaceæ*. But in the latter rust the pedicels are obliquely attached, whereas in the one on *Chomelia asiatica* these are not oblique. The spore measurements also show variations.

Description of the rust.—Telia hypophyllous, subepidermal, blackish, aparaphysate; teliospores 2-celled, obovate, 35–38·8 by 25–30 μ, slightly or not constricted at septa, germinating without rest period; wall yellowish-brown, 3·5–5 μ thick, laminate, hygroscopic; pedicel hyaline 42–87 μ long. Basidiospores thin-walled, spherical, measuring 12 by 7 μ.

Hab. on leaves and twigs of *Chomelia asiatica* O.Kze., leg. M. J. Thirumalachar, Chamundi Hills, Mysore, 15-7-1941. Type specimen deposited in the Herb. Crypt. Ind. Orient of the Imperial Agricultural Research Institute, New Delhi.

The writer wishes to acknowledge his indebtedness to Dr. B. B. Mundkur, Dr. M. A. Sampathkumaran and Dr. L. N. Rao, for

guidance and encouragement given in the course of this work.

M. J. THIRUMALACHAR.

Department of Botany,
Central College,
Bangalore,
April 14, 1942.

[1] Cooke, M. C., *Exotic Fungi, Grevillea*, 1882, **10**, 125.

ON "THE MANUFACTURE OF GLANDULAR PRODUCTS IN INDIA"

PROF. B. B. DEY[1] has drawn pointed attention to the urgent need for increased emphasis on hormone-research in India and towards the possibility of producing almost all the glandular products used in medicine from indigenous raw materials. It is a pleasure to be able to record that considerable progress has already been achieved in this direction, of late. Barring insulin and the sex hormones, *e.g.*, œstrus-producing hormone, corpus luteum hormone and the male hormone, almost all other glandular products commonly used in therapeutics, such as adrenaline, pituitary (posterior lobe) extract, dry thyroid powder, liver extracts, etc., are now being produced largely in and around Calcutta and also partly in Bombay from indigenous raw materials. Many of these are found on careful analysis and standardization, both chemically and pharmacologically, to be of good quality and agreeing with standard requirements. The production is not yet commensurate with the demand but this aspect will not be difficult to attend to gradually, provided sufficient encouragement is forthcoming from the medical profession and the public.

As has been pointed out by Prof. Dey, accurate and unbiassed standardization of every batch of the products manufactured is the key-note of success in such endeavours. Naturally many manufacturing concerns in this country cannot afford to maintain a technical staff and equipment adequate for such responsible work. During the last 3 or 4 years, the Government of India have rendered considerable help in this regard, through the Biochemical Standardization Laboratory, to the manufacturing concerns engaged in the production of these glandular preparations. To give a real fillip to this industry, however, facilities, of a much more comprehensive character than are at present available at the Biochemical Standardization Laboratory, have to be provided.

Excepting the anti-anæmic principle of the liver, almost all glandular products can be biologically assayed fairly accurately on laboratory animals. For satisfactory and reliable data, however, it is necessary, in many instances, to use animals kept under standardized conditions, with regard to temperature, diet, housing, mating, etc. This necessitates a large animal-housing establishment with trained personnel to look after the animals. Unfortunately many medical research institutions in this country have not paid adequate attention to this vital paraphernalia of a biological laboratory. Calcutta, in spite of many facilities for research work, is very poor in this regard. The idea that the climate of Calcutta is not suitable for laboratory animals is untenable, as with more or less similar warm climatic conditions, Bombay (Haffkine Institute) has succeeded in rearing and breeding white mice and white rats in sufficient numbers.

If collaborative effort between chemists, pharmacologists and bacteriologists are encouraged and adequate laboratory facilities are offered, there seems no reason why every type of glandular product of standardized potency could not be made in India from Indian raw materials. Some of these like adrenaline, thyroxine and sex hormones can also be synthesized provided the intermediate chemicals and reagents are brought out into India from Great Britain or America.

B. MUKERJI.

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Public Health, Calcutta,
April 13, 1942.

[1] This Journal, 1942, **11**, 110.

REVIEWS

Mineral Metabolism. By Alfred T. Shohl. (Reinhold Publishing Corporation, New York; Chapman & Hall Ltd., London), 1939. Pp. x + 384. Price 30*sh.*

At the commencement of the last decade, scientific investigators in the field of nutrition felt the urge of a new approach to the problem of human nutrition. It was becoming increasingly evident that nutriment meant more than the calories and the "building units" derived from carbohydrates and proteins and that there was something more fundamental which catalysed the entire chain of biochemical reactions, generalised as metabolism. The effect of traces of highly active and specific compounds like vitamines and the function of minerals and other "trace" elements, were unravelled. Interest in these fields, vitamines and minerals, was aroused and during the last fifteen years, there has accumulated a great mass of data regarding the role of minerals in the field of nutrition.

The volume under review represents a praiseworthy and successful attempt at giving a connected and readable account of the various aspects of mineral metabolism. In a series of fourteen chapters, the author has tried to cover this comparatively new field of human nutrition. Particular attention may be invited to the chapters relating to calcium and magnesium, phosphorus, iron, iodine and trace elements, which respectively deal with the function of these minerals. The interrelationships between a few of these elements and some of the vitamines and hormones, calcium and calciferol, calcium and parathyroids, iodine and the thyroids, are discussed in great detail.

Physicians and dieticians will feel particularly grateful to the author for the last chapter on mineral intakes, balances and requirements, which discusses the mineral requirements of the adult man, the pregnant and the lactating woman and the growing infant. The comprehensive and well-documented bibliography appended at the end of each chapter is helpful to those interested in diving deep into the subject. This is a volume which will be welcomed not only by the scientific investigator devoted to researches in the science of animal nutrition but also to physicians, physiologists, pediatricians and dieticians, who are interested in the application of these fundamental results to human welfare.

Biological Aspects of Infectious Diseases. By F. M. Burnet. (The University Press, Cambridge), 1940. Pp. vii + 310. Price 15*sh.*

This is an unusual volume which discusses the problem of infectious diseases of man from the point of view of a biologist. The author is of the opinion that a biological approach to this problem might offer a better means of understanding and controlling diseases which constitute an important aspect of human life.

The five parts which include the twenty-five chapters of the volume, present the varied aspects of the problem—the ecological considerations of the incidence and spread of infection, the evolution of infection and defence, the variety and nature of the infective agents, the nature and significance of immunity, the mechanism of the causation and the control of infectious diseases and the future evolution of infection in relation to man. Some of the important infectious diseases,—diphtheria, influenza, cholera, plague, malaria, yellow fever, etc.,—are discussed against a historical background of their first incidence and their subsequent spread and control.

Under the caption "How infections spread", the author has given an illuminating survey of the modes and mechanisms of the spread of infection under the conditions of modern life. Infections which incriminate the lower part of the digestive tract are spread by the dissemination of fœcal material which might contaminate water, milk, and food in many a direct and indirect way, the finger and the fly constituting the principal agencies in this respect. An efficient sewage disposal, a pure water supply, stringent food laws, supply of hygienic milk and personal cleanliness, have together conspired to conquer many of these diseases. An outbreak of typhoid or an epidemic of infantile diarrhœa, should therefore be looked upon as a civic disgrace. It is a well established fact that typhoid fever and filthy drains go together and the most

elementary precaution that an enlightened municipality should take is to keep drinking water and sewage out of each other's way.

"Droplet infection" or infection by the respiratory route is another mode of spread of disease, and this form of spread is considered to be the most important route by which infections spread among the more advanced communities.

Other forms of spread which are peculiar to the social diseases, and the "unnatural" spread of diseases through bites of insect vectors are discussed in a very interesting manner.

The outlook for the future, as visualised by the author, appears alarming; most of the new diseases which have recently appeared constitute infections of the brain and the spinal cord. The nature of certain rare illnesses which occur, particularly in infants, and which are labelled encephalitis, still remains obscure; another disquieting possibility which the author fears, is the attempt on the part of the belligerents to disseminate infection artificially. The attack through the bacteriological weapons would remain invisible and unknown and death would be delayed for days. How such an insidious weapon is to be combated, is a problem of the future but let us all hope that an unhappy problem with such tragic consequences will never arise.

The volume represents a highly fascinating and stimulating account of the biological aspects of infectious diseases which afflict man and is one which is bound to command the attention of a wide circle of readers.

Practical Solution of Torsional Vibration Problems. Vol. II. By W. Ker Wilson. (Chapman & Hall, Ltd., London), 1941. Second Edition. Pp. xxi + 694. Price 42*sh*.

This is a continuation of the first volume published in 1940 by the same author. The opening chapter (Ch. 7) deals with the determination of stresses due to torsional vibration at resonant speeds. A clear conception of damped and undamped vibrations, damping coefficient, the dynamic magnifier, etc., is first given and their application is then illustrated in the design of vibration recording instruments, vibrographs, accelerometers or flexibly supported machines. This is followed by the study of exciting and damping forces with reference to propellers, air-screws and engines. The cases of apparent damping—as contrasted with the usual type of damping which functions by changing the vibrational energy into heat—viscous damping, overall damping and elastic hysteresis damping are then discussed with special reference to engine crankshaft systems. A brief account is then given of the nature and physical properties of the materials used in the manufacture of these crankshafts and this is followed by the calculation of torsional vibration stresses in them, illustrated with reference to all possible types. Typical stress diagrams are also given.

The next chapter (Ch. 8) is devoted to a detailed description and method of using different types of instruments for the measurement of torsional vibration amplitudes and stresses. The Junkers Torsiograph, the Geiger Torsiograph for low and high speeds, the D. V. L. Torsiograph, the Rotational Accelerometer, Askania Hand Torsiograph, M. I. T. Sperry Torsional Vibration Measuring Equipment, the R. A. E. Mark Va Torsiograph, the D. V. L. Recording Torsionmeter are all described with necessary details and methods of using and calibration. How the torsiograph records obtained from these instruments can be analysed and measurements made are illustrated in the next chapter, taking into consideration all typical cases. This is followed, in Chapter 10, by an exhaustive study of the methods adopted for securing a safe working speed range by an appropriate adjustment of the natural frequency or in other words by reducing the amplitude of torsional vibration by altering the position of critical speed. Four such methods are given in good detail. In all these the reduction of vibration amplitudes is accomplished without any appreciable absorption of the exciting energy. By frictional damping devices, however, it is possible to introduce into the system additional work absorbing forces which operate when the amplitude exceeds a predetermined amount; three methods of doing this have been described. In multi-cylinder engines it is sometimes possible to obtain a favourable damping effect by a different method, by alteration of the firing order, and the author has shown with illustrative examples, how this can be effected.

Another outstanding achievement in the development of vibration absorbers is that of the Rotating Pendulum Vibration Absorber. This, as the author has pointed out in his preface to the volume, is one of the most valuable contributions to the aircraft engine design in many years. An exhaustive study of its theory and constructional details forms the subject-matter of one big chapter (Ch. 11).

Yet another case in which the problem of torsional vibration comes into great prominence is in the direct coupling of d.c. or a.c. generating sets to internal combustion engines. In the last chapter the dynamic characteristics of such generating sets are discussed in full and suitable methods are suggested to keep the coefficient of cyclic irregularity to within desirable limits.

This second volume is as profusely illustrated with sketches and photographs as the first, and the number of numerical examples actually worked out with a view to elucidate the principles, is equally large. The two volumes together should be a very valuable guide to the designing engineer who has to tackle problems on torsional vibration.

E. K. R.

Bureau of Education: Education in India, 1938-39. (Government of India Press, Calcutta), 1941. Pp. 138. Price Rs. 3.

This Report has followed very closely upon the heels of the previous one for the year 1937–38. Indeed the early appearance of this Report was already foreshadowed in the preface to the previous one. While one must certainly appreciate the speed with which the work has been done, one also wonders whether in a country where education moves at the pace of a snail it is really worth while to have such elaborate annual Reports. It would appear that if any striking progress is to be recorded, and if educationists and the general public are to understand the trend of this progress, a period of at least five years should elapse between the appearance of one Report and the next.

The present Report closely resembles the previous one for 1937–38 both in regard to the content and manner of presentation. Hence the suggestions made in reviewing the previous Report, as to the desirability of providing a more suitable format, an index of topics, and bold headings for chapters, apply here also.

In a short review such as this, it is perhaps best to confine one's attention to one or two of the most outstanding features of the Report. Recent thought in Indian education has directed itself to the answering of two fundamental questions. Firstly, what is the type of education best suited to this country? Secondly, how is this education to be financed? The attempt to answer these questions has led to the formulation of two well-known schemes, the Wardha Scheme and the Vidya Mandir Scheme. Considerable reference is made to both these schemes in the Report under review.

The Wardha Scheme primarily addresses itself to the question of the type of education needed in this country and recommends emphasis upon the handicrafts. The Vidya Mandir Scheme, on the other hand, primarily concerns itself with the financing of popular schools and suggests the creation of numerous local endowments in lands and money as in the case of temples. The Report is generally sympathetic to the fundamental ideas in these schemes.

But the very origin of these schemes must be traced to the acute and growing unemployment of educated persons in recent years. It was felt that one of the most important causes for this state of things was the prevailing literary character of our educational system which produced persons who could not readily fit into the economic structure of the country. In order to consider this problem Messrs Abbott and Wood were invited to India. Their Report, which is especially concerned with the higher stages of education, advocates vocationalization and the diversion of students from university courses into practical walks of life. The Report under review deals at some length with this problem and indicates the provinces in India where new organizations along these lines are under way.

D. S. Gordon.

MECHANISM AND CHEMICAL KINETICS OF ORGANIC REACTIONS*—A REVIEW

THE Faraday Society has brought out a timely discussion on this topic, a stock-taking of work that has been carried out in the last fifteen years. As Professor Ingold rightly remarks in his introduction, "the contributors have had before them the ideal of the elevation of organic chemistry to a physical status, by the supersession of its old empiricisms and recipes by physical understanding and exact technique".

Grouping together of the papers will be doing them scant justice as they cover a varied field and the following paragraphs deal with the several papers briefly.

Ingold, Hughes and co-workers have been investigating the mechanism of elimination reactions for over a decade and the two papers represent a report on the present position. The contribution by Dr. E. D. Hughes is divided into two parts, general principles and special applications. The earlier section gives a general account of substitution reactions, the duality of the mechanism and the influence of reactants and of solvents on the mechanism. In connection with the unimolecular mechanism, it is stated that "the rate controlling ionisation is slow because it has to pass over an energy maximum which occurs at a certain critical extension of the bond and a certain critical degree of charge transfer," and in the foot-note "that solvation must reduce activation energy by an amount of the order of magnitude of the bond strength". This is an interesting idea but is solvation a necessary preliminary in the case of all the compounds where substitution is studied? The evidence for a dual mechanism in both solvolytic and non-solvolytic reactions is well brought out. In the later section, the reactivity of neopentyl halides and the influence of halogens, the carbonyl, vinyl and aryl and allyl groups on solvolysis is discussed. It will be interesting to see in greater detail some of the unpublished results of kinetic studies referred to. As the paper indicates, more work on anionotropic systems is necessary.

The problem of aliphatic substitution is closely allied to that of elimination reactions and, as in the former case, a duality of mechanism is found necessary here also.

The study of 'Onium degradations under varying conditions has brought out the similarity between elimination by bimolecular (E_2) and nucleophilic substitution by bimolecular mechanism ($S_N 2$). Evidence, though not so complete, is also available to indicate a similar slow stage for unimolecular mechanisms E_1 and $S_N 1$. The paper includes a clear discussion of environmental influences on the reaction, including the cases where both elimination and substitution occur together. The importance of kinetic studies in understanding the mechanism is well brought out. The last section of the paper deals with constitutional influences. An explanation of the Hofmann Rule which is related to the inductive effect and the Saytzeff Rule related to the tautomeric effect leads to a discussion of the combined effects which is well illustrated by a study of tertiary amyl compounds. Attention has been confined in the paper to only 1 : 2 elimination since quantitative studies on other eliminations are inadequate.

J. N. E. Day and C. K. Ingold discuss the mechanism of hydrolysis and esterification. The main division of mechanism for both types of reactions depends on whether or not a preliminary proton transfer to the carboxyl compound is necessary for the reaction. A further division is introduced by considering the position of rupture, the bonds involved being acyl-oxygen or alkyl oxygen. The different alternative mechanisms which have been labelled are discussed and in the final section is given a summary of the mechanisms and a table showing the diagnostic characteristics of mechanism by which these may be recognised.

Dr. H. B. Watson has contributed two papers dealing with carbonyl compounds. In the first he has discussed the acid and base catalysed condensation reactions of carbonyl compounds and has briefly indicated the mechanism of aldol condensation, Knoevanagel and Claisen reactions and Michael addition. The second paper deals with the influence of substituents and the acid and base catalysed prototropy in carbonyl compounds.

* *Transactions of the Faraday Society*, December 1941.

Based on the earlier work of Haber and Willstätter, Weiss has discussed the Canizzaro reaction and outlined a mechanism which is found to accord with experimental data on the kinetics, the reaction in heavy water, etc., and the action of alcoholates. The simple processes of electron or hydrogen transfers, for which the energy requirements are satisfied, renders the free radical mechanism acceptable, especially with the important reference to peroxide catalysis. While the benzoin condensation may be related to the Canizzaro reaction, as Ingold rightly points out in the discussion, there is no compelling evidence adduced by Weiss in support of his scheme to eliminate the Lapworth mechanism.

Gwynn Williams has discussed the addition to olefinic compounds. In spite of the general nature of the title, attention is practically confined to only halogen additions. The evidence for establishing the complex nature of the reaction is well presented though in discussing the final mechanism, a comprehensive scheme proposed by Leighton[1] appears to be ignored. Gwynn Williams also glosses over the difficulty of stereochemical isomer formation and the interconversion geometrical isomers in the process.

Blaughan and Polanyi have developed the theory of activation energy of "negative substitution" simplifying the calculations of Ogg and Polanyi. The simplification is found applicable to symmetrical substitutions. While the model of the transition state of these authors is useful for calculations, the evidence provided does not completely eliminate the symmetrical charge model of Hughes. The calculations make use of the extension of bond necessary and the potential energy of C – X bond. For the former an empirical revision of ionic radii leads to an extension of 0·59Å in the C—Hal bond, while for the potential energy curves, both Morses' equation and Linnet's equation lead to approximately similar results. In the last section, the solvent effect is considered and appears to be negligible.

Balfe and Kenyon discuss the mechanism of anionotropic change suggesting an ionic mechanism in which rearrangement is associated with retention of optical activity while replacement involves racemisation. In the course of the discussion of their work on allyl alcohol and its derivatives, the authors suggest for these some sort of co-ordination between the hydroxyl group and the γ-carbon atom. It is obvious that more work of a kinetic nature is needed in the field for a proper understanding of the phenomenon.

Bradfield and Jones review the present position of electrophilic benzene substitution reactions. The most extensive studies have been on nitration and for this reaction, the comprehensive work of Holleman interpreted by the authors and the kinetic studies of Ingold and co-workers naturally cover the ground. The correlation of the kinetic studies with the dipole moment deduced by Eyining and Ri is indicated towards the end. Sulphonation has not been studied with the same thoroughness. The only important mechanistic study appears to be that of Vicary and Hinshelwood and obviously more work is needed before any comprehensive mechanism can be given. A number of kinetic studies on halogenation indicate that the process involves halogen molecules and not atoms in nuclear substitution. The work of Wibaut at high temperatures is referred to, though the reaction is heterogeneous and in the gas phase, but no explanation of the abnormality is given in the body of the paper. Waters, however, suggests in the discussion that in these cases, halogenation involves halogen atoms. The paper contains a thorough discussion of the halogenation of phenols and ethers. The relative rates given at the end may not be very significant until more is known about group-interactions than we do at present.

Baker contributes an interesting treatment of the problem of side-chain substitution by the method of relative energy levels. Attention is confined to bimolecular nucleophilic substitutions. While the arbitrariness in procedure precludes any significance for the figures given on an absolute basis, a reasonable approach to a comparative study is provided and group influence is discussed on this basis.

Fairbrother discusses the mechanism of the Friedel and Crafts' reaction. The primary stage involves the transformation of carbon-halogen bond to the ionic condition with the formation of a complex with the metal halide catalysis. The evidence of isotopic exchange is adduced in support of

[1] *Photochemie*, A. A. Noyes, P. A. Leighton, Rollefson, Hermann et Cie.

this view. Measurements of dielectric polarizability also lead to the same conclusion in cyclohexane solution.

Reactions involving free radicals are considered by Waters. Free radicals are shown to be reagents of an electrophilic type. The velocity of all reactions involving free radicals depend on their rate of production from stable covalent molecules. Recombination of free radicals involves little activation energy. One section deals with the meagre information available on the kinetics of catalysed free radical reactions. Solvent effects are considered both where the solvent is a reactant and where it is only a diluent.

The kinetics of ring closure is discussed by G. M. Bennett who summarises the work done by him and his colleagues in the last decade on a variety of ring closure reactions. The factors involved are well discussed and Carothers' work on ring closure and an explanation of Ruzicka's experiments are considered in the last section.

As is the case with all Faraday Society discussions, the discussion following each paper is an important contribution to the elucidation of the problems and the whole collection of papers provides a stimulus for further work in several fields.

S. V. ANANTAKRISHNAN.

CHINESE LESSONS TO WESTERN MEDICINE

Chinese Lessons to Western Medicine. By I. Snapper. Foreword by G. R. Minot. (Interscience Publ., New York), 1941. Pp. 380, 132 illustrations. Price $5·50.

THE author, a distinguished Dutch physician and research worker, describes systematically the clinical experiences, well founded on laboratory investigations, collected by him as professor and head of the department of medicine, Peiping Union Medical College, Peiping, China. This teaching and research hospital, founded twenty years ago and supported since then by the China Medical Board, Inc., a branch of the Rockefeller Foundation, is of such a high standard, compared even with the best institutions in the West, that these "lessons" need careful attention. From the introduction, which contains information on organisation and administration, it should be noted that the final (fifth) year students live and work for a full year as internes at the hospital. The great difficulty in obtaining permission for the performance of post-mortems, one of the most serious obstacles in the way of medical progress in our country, was overcome to a great extent by signing post-mortem papers (permitting post-mortems) *before* admission of the patients. A good attempt was made towards the solution of the blood-donor-question, complicated, there as here, by superstitions, multiple infections and undernutrition. The first chapter, concerned with *nutritional problems and avitaminoses*, shows the all-importance of malnutrition, which modifies almost all clinical pictures in North China. Peiping-diet is deficient in proteins, calcium, vitamin A, C and D; whereas B-deficiency is prominent in the rice-eating South of China just as in South-India, the population of North-China gets all the necessary vitamin B from millet, which is eaten unmilled like ragi. The next chapter deals with *infectious diseases*. Diphtheria seems to be more toxic than here. Scarlet fever, which is a great rarity among Indians, is endemic in Peiping. Pneumonia presents the same picture as here, though influenzal pneumonias seem to be more common. Mumps (epidemic parotitis) is frequently accompanied or followed by neurological complications, such as encephalitis, meningitis, radiculitis or peripheral neuritis; interesting case histories illustrate the author's experiences in this as in other chapters. The description of typhus fever is not detailed enough to make a comparison with the different groups of Indian typhus possible. However, murine flea-borne rickettsias as well as human, louse-borne strains seem to be responsible there. Louse-bearing relapsing fever is very common and presents diagnostic difficulties, many cases being atypical and complicated with Salmonella enteridis infection. Bacillary dysentery is of astounding frequency; the differentiation of the many chronic cases from chronic ulcerative colitis is described. Cases of entero-colitis are encountered which show a degree of dehydration and acidosis, still worse than in cholera; they respond quickly to parental glucose

and saline administration. Amebiasis and liver abscess present important diagnostic problems; cases are described where amebiasis caused severe appendicitis, cecum perforation or psoas abscess; in such cases amebæ were frequently absent in the stool. Photos show amebiasis of the skin. "The parasitic disease which places its mark all over internal medicine in North China is kala-azar", comparable with the role which malaria and ancylostomiasis play in South India. The diagnostic procedure is puncture of the sternal marrow; the routine treatment: ureastibamine or neostibosan, to which even many cases of severe noma respond quickly. Sand-flies transfer kala-azar from dogs either to dogs or to men (good photos of canine k.-a.). The part on encephalitis brings valuable observations and a clear-cut diagnosis of the type B, due to the Japanese virus, from type A, which is not to be found in Peiping at present. The author's unfavourable experiences with rabies vaccination differ from those made in India. Chapter III deals with pulmonary, intestinal and peritoneal *tuberculosis*; a case history of tuberculosis of the pylorus is illustrated by a radiogram and the histological picture. In Chapter IV the rarity of *amyloid degeneration*, in spite of the frequent occurrence of chronic tuberculosis and osteomyelitis, is traced to the absence of dairy products in the local diet. Chapter V is concerned with *cardio-vascular diseases*. Rheumatic valvular disease, not rarely combined with vascular syphilis, occurs frequently; but a typical history of rheumatic fever preceding it, is usually absent, just as is found in India. Arteriosclerosis, coronary thrombosis, diabetic and senile gangrene are remarkably rare. The syndrome of "hypertensive cardio-vascular disease" (fundal changes, etc.) is found with a surprisingly low blood-pressure; the extreme high blood-pressure figures which we see here in essential hypertension among strictest vegetarians are not described. Pick's syndrome and aneurysms are frequent; case histories and photos show the diagnostic difficulties of the former, the various symptoms and signs of the latter. Subacute bacterial endocarditis is frequently seen, which differs from the observations in this part of India. Whereas in Peiping, thromboangiitis obliterans (Buerger's disease) is not more common than in the West, it is very frequently found in South India; both observations point towards the independence of this condition from a previous typhus fever; in the endemic typhus area of North China thromboangiitis is not very common; here, where typhus is rather rare, it is surprisingly frequent. In Chapter VI *renal affections* are discussed. Glomerulo-nephritis is traced to skin affections (pyodermia) rather than to tonsillitis, etc. Some cases may be related to malaria, possibly as an anaphylactic reaction;* chronic nephrosis mostly is seen accompanied or followed by some glomerular lesion, which determines finally the renal failure. A slight renal acidosis leads to renal osteodystrophy because the chronic deficiency of calcium and vitamin D favours these skeletal changes. The rarity of renal stones in spite of vitamin A deficiency is explained by the low calcium intake. The author's experiences on coliform group infections, which are widely spread and frequently missed here, would be of interest. *Diseases of the liver and biliary system* are dealt with in Chapter VII. Catarrhal jaundice hardly ever leads to acute yellow atrophy and arsphenamine causes jaundice exceptionally—in spite of the poor nutritional condition, observations which are in accord with these made in South India. Hydatid cysts derived from sheep are not infrequent; cases of diagnostic interest are reported. Cirrhosis of the liver, of Laennec's or portal type is very frequent, though alcohol consumption is low; dysentery and semi-starvation are suspected as causative factors. Low albumin content of the blood plasma favours the development of ascites. The anatomical conditions for the development and the diagnostic importance of venous hum in the xiphoid region are discussed. Fever in cirrhosis indicates portal thrombosis. The frequent cases of splenomegaly with anæmia and leucopenia without a frank cirrhosis of the liver are called Banti's syndrome, though the histological picture of the spleen differs from the original description. However splenectomy causes a quick improvement of the anæmia and thrombocytopenia. Banti's disease with hæmorrhage from stomach or intestines is differentiated as splenic thrombosis, which does not lead to cirrhosis of the liver and is benefited by splenectomy

* *Cf.* Heilig, R., *Ind. Med. Gaz.*, **1941, 76,** 519.

equally well. Primary carcinoma of the liver, usually developing in a cirrhosis, is common. Gallstones are comparatively rare; they are equally distributed between men and women; no cholesterol—but calcium bilirubinate—stones are seen and easily visualized by X-ray. Cholecystitis, mostly of E. coli origin, occurs frequently; hints are given here in differentiating it from hepatitis and liver abscess. Important observations on *anæmia* are communicated in Chapter VIII. Hypochromic, iron deficiency anæmias are common. But the author deals mainly with nutritional macrocytic forms with or without megaloblastic bone marrow; most of them respond well to yeast. Some of those cases very much resemble genuine pernicious anæmia; their improving on yeast or on very small doses of liver, so far as blood picture and the frequent neurological signs are concerned, the absence of hæmolysis and poikylocytosis and the reappearance of free hydrochloric acid when the anæmia is cured, differentiate them from it. This macrocytic anæmia is caused by the deficiency of the extrinsic factor in the food. A case is reported, showing hypofunction of the anterior pituitary lobe, hypogonadism, achlorhydria and macrocytic anæmia, a syndrome, previously defined by the author. All kinds of hæmorrhagic diathesis are frequently encountered; cases of true and sporadic hæmophilia, thrombocytopenic and anaphylactoid purpura and agranulocytosis are described. Leukæmias show the usual picture. In Chapter IX, which contains *some remarks about malignant tumours,* comparative figures are given on the frequency of carcinoma of the liver. An interesting discussion follows on the different types of lymph gland tumours, especially reticulosarcoma and lymphoepithelioma, the most common members of that group in North China; they are frequently small primary tumours of the lymphoid structures of the mouth or nasopharynx; they invade the base of the skull and develop large metastases first in the cervical glands, later all over the body. Lymphosarcoma occurs frequently and causes gastrointestinal complaints. *Intoxications* are treated in Chapter X. Addiction is found not only to opium, which is smoked by all classes without doing much harm, but also to heroin, which is used as an intravenous injection in the final stages and ruins the addicts who belong mostly to the lowest classes. In suicide the usual poisons are opium and barbital (veronal). The very serious prognosis in opium-poisoning seems to have somewhat improved by the routine treatment with the "iron lung" (Drinker's respirator) and intravenous coramin-injections (3 c.c. maximum); those poisoned with barbiturates need heroic doses of strychnine (10 mg. = gr. $^1/_6$ repeated every half or one hour up to hundreds of milligrams) and intravenous glucose infusions. Drug poisoning is seen due to the use of indigenous mercury remedies and castor beans (ricin). In the final chapter on *miscellaneous diseases* it is noteworthy that cysticercosis (especially of the skin) is a very common ailment. Diabetes is frequently encountered; its benign course is explained by the low caloric intake and the absence of butter from the food; vegetable oils with their long chains of partially unsaturated fatty acids are hardly ketogenic. Endocrine disorders—apart from Grave's disease—are rare, osteomalacia and late rickets very common. The extremely well written book, which bears witness to the deep knowledge and keen interest in the new surroundings of the author as well, as to the high standard of his clinical and, especially, his laboratory staff, should be read by every clinician interested in clinical research in general and in geographical (comparative) medicine in special. One hundred and thirty-two illustrations, many of them excellent photos and radiograms, increase the didactic value of these Chinese-Dutch lessons to medicine all over the world.

ROBERT HEILIG.

THE CHEMISTRY AND THERAPY OF GLANDULAR PRODUCTS*

BY

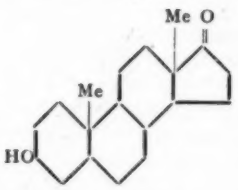
PROF. B. B. DEY

(*Presidency College, Madras*)

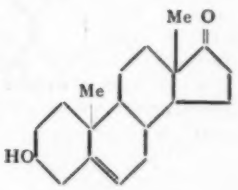
THE researches carried out in the field of hormones in the last two decades have been so extensive that only a cursory glance at the main results can be given in this short review.

Sex Glands.—The sex hormones may be considered to be made up of the testicular, the follicular and the progestational principles. The present-day advance in this field is largely due to the happy discovery that human urine and the serum of pregnant mares form an excellent source of the male and the female hormones, so that sufficient material could be accumulated for chemical as well as therapeutical investigations. Another equally important contributory factor has been the elaboration of two very important methods of biological assay, *viz.*, "The capon-comb test" for the male hormones and the "vaginal smear test" for the œstrogenic hormones. The isolation of these hormones is based on the general principle of extraction by means of fat solvents and concentration by means of selective distribution between suitable organic solvents.

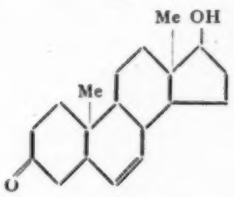
Among the male hormones are Androsterone, Trans-Dehydro-Androsterone and Testosterone, the most potent being Testosterone which is therefore to be considered as the true testicular hormone. All of these hormones have been obtained in a pure crystalline condition and their structures, represented below, have been elucidated by degradation reactions as well as by partial syntheses from known sterol derivatives.



Androsterone



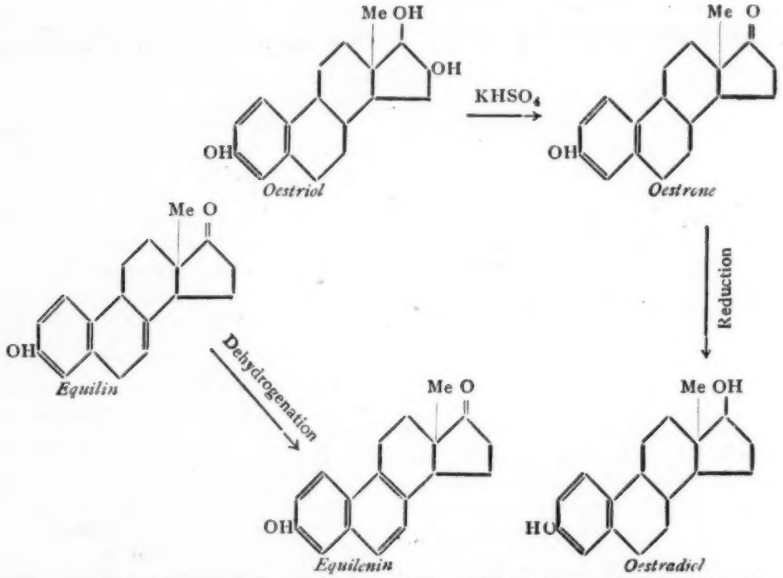
Trans-Dehydro-Androsterone



Testosterone

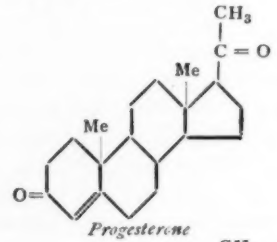
The ovarian hormones play a most important part in the sexual cycle of the female. The "œstrogenic" or the "follicular hormones" induce the development of the uterus, of the vagina and of the mammary glands; the corpus luteum or the "progestational hormones" prepare the uterus for the embedding of the fertilised ovum. Among the œstrogenic hormones are Œstrone, Œstriol, Œstradiol, Equilin, Hippulin and Equilenin. Of these the œstradiols are the most active and should be regarded as the true ovarian hormones. The constitution, as well as the interrelationships of these hormones are brought out in the following scheme:

* A brief summary of a course of four lectures delivered under the auspices of the Madras University.

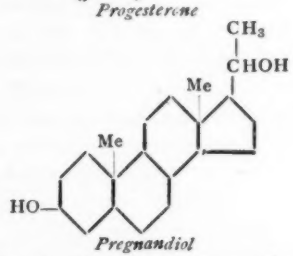


The structures of these compounds arrived at by degradation reactions have been confirmed by the brilliant total synthesis of Equilenin by Bachmann (1940), the first achievement of its kind in the field of sex hormone synthesis.

Among the corpus luteum hormones are Progesterone and Pregnandiol:



Progesterone



Pregnandiol

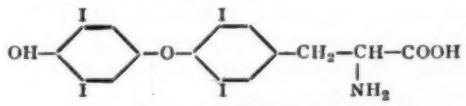
Pregnandiol is inactive and can be derived from Progesterone. The structure of progesterone has been established by its partial synthesis starting from stigmasterol. The drug is now commercially prepared from stigmasterol which in its turn is manufactured from soya beans.

All these sex hormones alike possess the cyclopentenophenanthrene ring structure, which, it will be recalled, is also the basic structure of a wide variety of biologically important products such as sterols, bile acids, heart poisons, saponins, carcinogenic hydrocarbons, cortical hormones and vitamin D.

Several of these products are commercial drugs and are extensively used in the treatment of sex disorders. An important development during the last few years has been the elaboration of the "pellet therapy" wherein pellets of the crystalline hormones are introduced subcutaneously and made to act slowly and steadily, thereby simulating the action of the normal endocrine glands.

The Thyroid Gland.—The endocrine function of the thyroid was recognised very early; in fact Murray laid the foundation of the science of organotherapy in 1891 when he administered extracts of sheep's thyroid glands for the treatment of myxœdema. The gland produces a hormone which catalyses the oxidative

process in the body. The active principle of the gland was isolated by Kendall in 1914 by alkaline hydrolysis of the gland and was termed Thyroxine. Harington worked out its structure by degradation reactions and finally confirmed it by synthesis:



Thyroxine

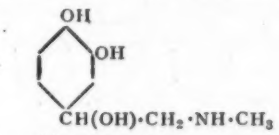
Both the natural and the synthetic products are now available in the market and are used for the treatment of hypothyroidism. For clinical purposes, however, desiccated thyroid (Thyroidium siccum) is the drug of choice. Recent investigations have shown that thyroxine does not account quantitatively for the activity of the whole thyroid and that thyroglobulin itself or a complex peptide of thyroxine is to be regarded as the real thyroidal hormone. One of the interesting developments of recent years has been the artificial production of iodinated proteins which possess the "thyroidal activity". It has been shown in several instances that small amounts of thyroxine could be actually isolated from these iodo-proteins.

The Parathyroid Gland.—The parathyroids are the smallest of the endocrine glands. They produce an internal secretion,—*viz.*, "parathormone"—which is concerned with the regulation of calcium metabolism and with controlling in some way the concentration of calcium and phosphorus in the blood. Tetany which follows the surgical removal of the parathyroids is due to the lowering of the blood calcium. Recent researches go to show that the primary action of the parathyroid hormone is on the phosphorus metabolism and that changes in the Ca-metabolism are but consequent to alterations of the P-metabolism.

Parathormone is believed to be of the nature of a protein but it has not yet been obtained in a pure crystalline condition. The preparation is based on the fact that the protein can be extracted by means of hot dilute acids. Substitution therapy with parathyroid extracts to relieve cases of parathyroid deficiency has now fallen out of practice, its place being taken up by irradiated sterols like vitamin D_2 and dihydrotachysterol (A.T. 10).

The Adrenal Gland.— The adrenal gland is made of two structurally different parts, the medulla and the cortex, which are entirely different with regard to the internal secretions elaborated by them.

The Medulla.—The discovery of Oliver and Schafer (1894) that adrenal extracts raised the blood pressure aroused great scientific interest and attempts were carried out in Abel's laboratory to isolate the active principle. Success finally fell to the lot of Takamine and Aldrich (1901) who were able to isolate it in a pure crystalline condition. The name Adrenaline or Epinephrine was given to it and the constitution was established by synthesis. The glandular mass was extracted with acidulated water and after removal of lipoidal contaminants, the pure base was precipitated with ammonia.



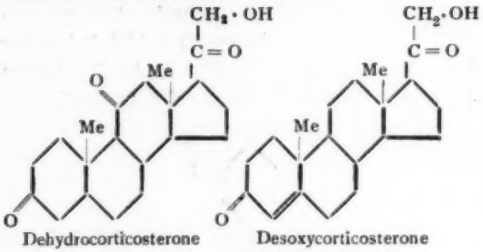
Adrenaline

Adrenaline stimulates the action of the sympathetic nervous system and is therefore called a sympathomimetic drug. It raises the blood pressure when injected subcutaneously and also mobilises the liver glycogen and so raises the blood sugar; its action in this respect is therefore antagonistic to that of insulin. For this and other reasons, Adrenaline finds extensive therapeutic usage, such as in the treatment of allergic disorders, in reviving the heart beat when it stops accidentally during surgical operations, in counteracting an overdosage of insulin and also in admixing with various local anæsthetics for prolonging their action. It is considered by many to be the hormone of emergency.

The Adrenal Cortex.—Researches carried out during recent years go to show that the adrenal cortex may indeed occupy a position in the whole endocrine system second in importance

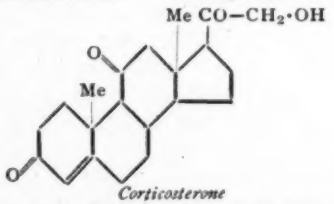
only to that of the pituitary gland. Stewart and Rogoff (1925) showed that the cortex was essential for life. Hartman prepared active extracts of the cortex for which the name "Cortin" was given. The method consisted in extraction of the minced cortical tissue with alcohol or ether and concentration by selective distribution between various organic solvents. The brilliant investigations carried out during the years 1936–1941 by three groups of workers, Kendall and Wintersteiner in America and Reichstein in Switzerland (Zürich) have resulted in the isolation of about twenty closely related steroid derivatives, some active and others inactive, from the crude extract "cortin".

Among the more important of these cortical hormones are Corticosterone, Desoxycorticosterone and Dehydrocorticosterone.



Dehydrocorticosterone

Desoxycorticosterone



Corticosterone

The structures were established by degradation reactions when steroids of known structure were obtained. Steiger and Reichstein (1937) also succeeded in partially synthesising desoxycorticosterone, starting originally from stigmasterol. Desoxycorticosterone is now available for the treatment of Addison's disease and other ailments traced to cortical deficiency, and is manufactured by the synthetical method.

It is now generally agreed that the cortex does not elaborate any single substance which can be regarded as the true hormone of the gland, but that it produces a surprisingly large number of closely related compounds which have specific effects differing qualitatively one from the other. These hormones control the metabolism of salt, water, potassium and carbohydrates and also the renal function. Addison's disease, which was recognised as early as 1855, has now been definitely shown to be associated with the adrenal cortex.

The Pituitary Gland.—The pituitary is the most important, complex and interesting of all the ductless glands and has been referred to by Sir Henry Dale as "the conductor of the endocrine orchestra". The gland is made up of two distinct portions—the anterior lobe and the posterior lobe, joined together by the "Pars Intermedia". A battery of hormones is elaborated by the pituitary but none have so far been obtained in a pure condition with certainty. Highly active fractions have been prepared and some placed on the market. The hormones are probably all of a protein nature.

The Posterior Lobe.—An aqueous acid extract of the posterior lobe yields "pituitrin" which raises the blood pressure and stimulates uterine contraction and also controls the renal excretion of water. The work of Kamm has however shown that pituitrin is not a homogeneous substance, but can be resolved into (1) Oxytocin, which causes the contraction of the uterus and (2) Vasopressin, which increases the blood pressure and also exerts an antidiuretic effect. Active extracts of the posterior lobe of the pituitary find important applications in obstetrics and also in the treatment of "diabetes insipidus".

The intermediary lobe is supposed to secrete a hormone known as "Intermedin"; its definite function in man has not yet been made clear but it has been shown to produce characteristic colour changes in the frog and in certain species of fish.

The anterior lobe produces a very large number of hormones which can be broadly classified under two headings, *viz.*, (1) those which produce general effects in the whole body and of which examples are to be found in the growth-promoting principle which has been

placed in the market under the name "Antuitrin-Growth" and the "Glycotropic principle" or the "Diabetogenic hormone", injections of which raise the blood sugar, and (2) those which produce specific effects on other glands. The anterior lobe of the pituitary is known to control and co-ordinate the endocrinal activities of the other glands and in its turn to be influenced by them. Thus the "Thyreotropic hormone" stimulates the thyroid gland and the "Corticotropic hormone" produces hypertrophy of the adrenal cortex. But much more important are the "Gonadotropic hormones", which have been shown to produce two different effects, *viz.*, follicular stimulation and luteinisation. Recently there have been claims for having isolated the two different principles in a pure condition. It is interesting to note that similar gonadotropic hormones appear in the urine during pregnancy and are produced by the chorionic tissue.

The Pancreas.—The work of Minkowski and Mehring in 1889 definitely established the relation between pancreas and diabetes mellitus. Active extracts of the pancreas which could be successfully employed in the treatment of diabetic patients were first obtained by the Toronto group of workers—Banting, Best, McLeod and Collip. The isolation of insulin created almost a revolution in medical practice for it made the definite control of this disease and the alleviation of the sufferings of the diabetic patients possible. The method of isolation of the hormone consists, in general, in extraction with acidified alcohol, precipitation with ammonium sulphate and final isoelectric precipitation. Of late, methods have been developed to crystallise insulin and they depend on the presence in minute traces of metals like zinc. Insulin has a molecular weight of about 35,000 and is believed to be a pure protein since hydrolysis results in the production exclusively of a number of amino-acids. Recent researches have shown that diabetes may not be due primarily to the deficiency of the secretion of insulin by the pancreas, but rather to certain other hormonal disturbances, especially of the pituitary. A number of attempts were made to prolong the hypoglycemic action of insulin, so as to avoid the necessity of giving frequent injections: the introduction of "Protamine-Insulin" by Hagedorn in 1935 and its modification by Scott into "Protamine-Zinc-Insulin" in the following year, together constitute a great advance in this direction. Certain groups of workers have recently claimed to have isolated a second internal secretion of the pancreas which has been named "Lipocaic", and which is believed to control fat-metabolism.

The Liver.—In 1929 Minot and Murphy showed that pernicious anæmia could be cured by the inclusion of liver in the diet. Attempts have been made ever since to isolate the anti-anæmic liver principle but up to now no preparation can claim to be homogeneous. Cohn prepared an active fraction—Fraction G—which was further purified by Dakin and West, who used "Reinecke Salt" to precipitate the active fraction and who believed it to be a complex peptide. The more recent researches of Subbarow and Jacobson have shown that the active principle is of a composite nature and that progressive purification leads to a gradual loss of potency due to the elimination of certain "accessory factors". Castle postulated the existence in the stomach of an enzyme—the "intrinsic factor"—which reacted with an "extrinsic factor" present in the food material to give rise to the antianæmic factor which was stored in the liver and sent from there to the bone marrow for haemopoiesis. Pernicious anæmia is therefore due primarily to the deficiency of the intrinsic factor and so the treatment consists in either supplying the intrinsic factor in the form of stomach preparations whereby the elaboration of the haemopoietic principle by the stomach is stimulated, or, by the actual administration of the preformed active principle in the form of liver extracts.

THE TWELFTH CONFERENCE OF THE INDIAN MATHEMATICAL SOCIETY, ALIGARH, 1941

THE INDIAN MATHEMATICAL SOCIETY held its twelfth conference at Aligarh at the Muslim University on the 27th, 28th and the 30th of December 1941. The delegates were welcomed by Prof. A. B. A. Haleem, Pro-Vice-Chancellor, who gave a brief history of the Muslim University and stressed the need for improving the methods of teaching mathematics in the country. The Conference was opened by Sir Zia-ud-din Ahmad, Vice-Chancellor of the University, who among other matters referred to the importance of a great mathematical work by El-Beruni called *Kanoon Masoodi* written in 1038, the translation and editing of which would throw light on the influence of Indian and Greek Astronomy on the researches of the Arabs. The Report of the Society's activities was read by the Secretary, Dr. Ram Behari, of Delhi University.

In his Presidential Address, Dr. R. Vythynathaswami (Madras) said that college instruction could not be separated from research except to its detriment and degradation. Mathematical discovery, he said, was a baptismal experience of something fresh rising in the human consciousness and miraculously revealing a new world of values—an experience which was enshrined in the Vedic Symbolism of *Ushas*, the Deity of the Dawn, or in the glamorous figure of *Lakshmi* rising from the Ocean of milk churned by the *Devas* and the *Asuras*. He then traced the various "dawns" that had illumined and transformed the mathematical outlook at various times and had given a deeper insight into the nature of mathematical thought.

The session was well attended by delegates from different parts of India and over 50 papers were contributed to the Conference. Besides the reading of the papers, there were three symposia—one on "Fourier Integrals and Transforms" with Dr. R. S. Varma of Lucknow presiding, a second on "Group Theory" under the Chairmanship of Dr. F. W. Levi (Calcutta) and a third on "The Origin of the Solar System" presided over by Prof. A. C. Banerji (Allahabad).

There were two evening lectures, one by Dr. A. Narasinga Rao (Annamalainagar) on "Mathematics and Modern Warfare" and the other by Dr. B. Ramamurti (Ajmer) on "How to make the Teaching of Mathematics interesting". Prof. D. D. Kosambi (Poona) addressed the students of the Mathematics Association of the Muslim University on the evening of the 27th December.

As usual there was a Business Meeting of the Society and a Discussion on the Teaching of Mathematics in Schools and Colleges initiated by Sir Zia-ud-din Ahmad.

Special features which made the Aligarh Conference noteworthy were the Annual Session of the Benares Mathematical Society held for the first time in collaboration with the Indian Mathematical Conference, and the announcement of a prize to be awarded once in two years for the encouragement of mathematical research which Prof. A. Narasinga Rao offered to institute. The details of the prize are under consideration by the Committee of the Indian Mathematical Society.

A. NARASINGA RAO.

DRIVE AGAINST MALARIA IN INDIAN CANTONMENTS

THE announcement of a drive against malaria in Indian Cantonments is a significant forward move in a country where malaria forms one of the major health problems. It is estimated on a rough computation that nearly a million deaths a year are directly due to malaria and that at least a hundred times as many people are suffering from the disease. The epoch making discovery of Sir Ronald Ross, elucidating the mechanism of malaria transmission in 1895, was quickly put to test in the field and there have been numerous outstanding examples of control of malaria in mainly urban areas and of populations under control, in several parts of the world.

While available methods of malaria control have been made use of in a few urban areas in India including Cantonments, a more generalised use of these methods to cover extensive hyper-endemic malarious areas has been largely limited on account of peculiar local conditions. India is essentially rural and

till recently the measures available for the control of malaria were much too costly to permit a large-scale control of rural malaria.

Up till recently, measures available for the control of malaria were,

(1) permanent measures—anti-malaria engineering,
(2) recurrent measures—use of larvicides,
(3) naturalistic methods—use of natural enemies, etc., shading, and
(4) use of drugs.

These measures have been used singly and in combination in Indian Cantonments, and other large-scale public works where labour is under control and in a number of other places mostly urban, with good results.

Recent work on the use of insecticides for killing adult mosquitoes, has brought out pyrethrum extract as a most useful addition to the several measures already available. This measure consists in a regular spraying of an extract of pyrethrum diluted with kerosene, all day-time resting places of anopheline mosquitoes once or twice a week. Field trials, with this extract by a number of workers in India have indicated this method as an effective, and at the same time a cheap anti-malaria measure bringing the control of rural malaria within the realms of practical possibility.

The anti-malaria drive now being organised, has more than circumscribed interest. The co-ordination of civil and cantonment agencies for the purpose of malaria control avoids unnecessary overlapping and should yield better control. The neglect of control of the civil population living in close proximity to a cantonment area was a serious omission, now removed. A central control, co-ordinating the work in different units, will considerably help in developing improved technique and valuable standards for future development.

The most important feature of the scheme is the organisation for the training of personnel. Successful control of malaria, very largely depends on efficient direction by men who are well trained in the work. While this scheme supplies an immediate need, they will serve as a valuable nucleus for expanding the work to cover wider areas under peace-time conditions. The example of an effective control of this disease in areas normally hyper endemic for the disease, will have an excellent propaganda value in rapidly expanding this activity into rural areas where it is most needed.

B. Ananthaswamy Rao.

SCIENCE NOTES AND NEWS

Indo-European Trade Link.—Beads recovered from the archæological site at Taxila (near Rawalpindi, the Punjab) have provided proof of a trade connection between Europe and Asia before the time of Alexander, when typical European beads from settlements dating as far back as the 5th century B.C. were imported into India.

Mr. Horace C. Beck, the well-known expert on beads, has recorded in a monograph (published as Memoir No. 65 of the Archæological Survey of India) the results of the examination of about 950 selected beads dating from about 700 B.C. to 500 A.D., which were recovered from excavations at Taxila by Sir John Marshall for over two decades!

Mr. Beck has also found about half a dozen beads from Taxila which appear to belong to an altogether earlier civilization. Among other interesting types of beads are those representing animals, birds and forms of human life. These are undoubtedly associated with some symbolism and were probably used as amulets.

A number of glass beads from the Bhir Mound, the earliest site at Taxila, have been found to connect with early Mediterranean culture, being similar to finds recovered in Corsica, Sardinia, and the Etruscan tombs in Italy. The study of glass beads from the Sirkap site, which dates from 200 B.C. to 100 A.D. has, on the other hand, revealed some influence of the Roman Empire.

Applications of Quaternions to Relativity and Radiation Theory.—It is well known that the algebra of quaternions is particularly suitable for representing the rotation group as well as the Lorentz group. In a recent paper (*Proc. R.I.A.*, 1941, **46 A**, 129) P. Weiss uses the formalism of quaternions to derive an explicit formula expressing Lorentzian co-ordinates in terms of retarded co-ordinates, for an arbitrary world line of the observer. The 'retarded co-ordinates' are (i) the 'retarded distance' s, *i.e.*, what appears to the observer as the ordinary 3-dimensional distance, (ii) the proper time τ of the observer, (iii) two variables θ, ϕ parametrising the observer's proper sphere (*i.e.*, these points of the light cone which appear to the observer as a sphere of radius s with himself at the centre). Various applications are made of the formula so derived, *viz.*, the retarded electromagnetic field due to a point charge and the classical equations of motion of a radiating point charge. V. R. T.

Solving Eigen-value Problems by Factorisation.—A very interesting method for solving eigen-value problems of the second order by factorisation of the second order operator into two mutually adjoint first order operators was given sometime ago by E. Schrödinger (*Proc. R.I.A.*, 1940, **46 A**, 9). A slightly different version of the method was subsequently given by L. Infeld (*Phy. Rev.*, 1941, **59**, 9). In a

recent paper (*Proc. R.I.A.*, 1941, **46 A**, 183) Schrödinger discusses further developments of the method such as the application to classical eigen-value problems with artificial boundary conditions and irrational eigen-values (problem of the vibrating string) to pairs of first order equations (spherical harmonics with spin) and finally to perturbation theory (Stark effect). The last-mentioned application rests on the circumstance that if the unperturbed problem has been solved by factorisation, it is often possible to introduce into the factorising linear operators small additional terms which produce the perturbing term in the Hamiltonian with sufficient accuracy. Where applicable the device has some advantage over the ordinary method as the perturbation of the eigen-values is obtained without troublesome quadratures and a closed expression is obtained for the perturbed eigenfunction instead of the well-known infinite series. V. R. T.

Salvage in the Milk Industry.—"A paper just issued by the Department of Scientific and Industrial Research (Water Pollution Research Technical Paper No. 8, H.M. Stationery Office, 1941. Price 4*sh.* net) is of special interest in view of the vital importance at the present time of ensuring that there is no waste of food. It is not generally realised to what extent milk and the valuable products and by-products from milk are lost in the waste washing waters from many milk collecting and distributing depots and milk products factories. During an investigation by the Water Pollution Research Board of the Department of Scientific and Industrial Research, information was collected on the amounts of valuable materials, such as milk, whey, and buttermilk, carried away in waste waters from the milk industry and on the extent to which these losses can be reduced by simple and inexpensive modifications in the operations in depots and factories and by more careful control of the processes of draining and washing milk churns, cheese vats, butter churns, and other equipment. It has been shown, for example, how the loss of milk can easily be reduced to give a total saving of at least 3 million gallons a year on the milk handled at all depots and factories in Great Britain.

"Even after all possible methods have been adopted to reduce losses, there remains the problem of disposal of waste waters containing milk and milk products. These waste waters are very polluting in character and much trouble has been caused by their effect on streams into which they have been discharged. Experiments in the laboratory and on a large scale have shown that it is possible to purify these waste waters by the activated sludge process and by filtration in percolating filters. These methods are similar in general principle to those in use in treating sewage at sewage works. The percolating filters were operated by a new method of "alternating double filtration", by which two filters were used in series with periodic change in the order of the filters in series. A full account is given of the operation of large-scale plants, showing that the waste waters can be satisfactorily treated to give a final effluent in which fish can live. The method using filtration is the more economical and convenient and the rate at which the waste waters can be treated in a double-filtration plant is considerably higher than is usual in the treatment of domestic sewage by the process of single filtration ordinarily used at sewage disposal works. Details are given of the design and size of plant required."

Heart and Circulation in Apoda: Amphibia.—The presence of an accessory sinus venosus in the heart of *Siphonops annulatus* (Amphibia: Apoda) has been reported by P. Sawaya (*Bol. Fac. Fil. Cien. Letr. Univ.*, S. Paulo XXII, 1941, No. 5, p. 209). It occurs in the angle between the left atrium and the ventricular base. As distinct from the principle sinus venosus, this is called *sinus venosus sinister*. The two communicate with each other by a narrow canal guarded by a valve which prevents the regurgitation of the blood from the large sinus to the small one. The *sinus venosus principalis* receives the posterior vena cava, and the right jugular while the *s. v. sinister* receives the left jugular vein. It is also intimately connected with the coronary system of the heart. The ventricle of *Siphonops annulatus* has a distinct coronary vessel system appearing on its surface as a compact net. The capillaries of this net carry the venous blood from the myocardium to both the *s. v. principalis* and *s. v. sinister*, those of the left side carrying the venous blood into *s. v. sinister*, while those on the right carrying it into *s. v. principalis*.

Observations on the cutaneous circulation of *S. annulatus* show that, correlated with the integumental respiration in this animal, as in other Amphibia, its circulation also is pronouncedly interesting. Two marginal vessels connected with each other in each segment by transverse vessels and by capillaries make the skin a highly vascularized organ, probably to make up for the reduced left lung in the animal.

Histopathological Effects of Certain Insecticides on the Midgut Wall of the Armyworm Larva.—The sixth instar larvæ of Laphygma (Prodenia) eridania, Cram, fed with lethal or large doses of poisons by the sandwich method, and after sufficiently long intervals of time, prepared by means of suitable histological methods, were subjected to critical examination. Similar preparations of larvæ that had not ingested poisons were also examined for comparison. It was found, that the ingestion of arsenicals (Lead arsenate; Paris Green; Calcium arsenate; Calcium arsenite; and Arsenic trioxide) was followed by disintegration of midgut epithelial cells, and damage to the midgut muscle fibres. The ingestion of sodium fluoride caused disintegration of the substance of the cytoplasm and nuclei of the epithelial cells. Sodium fluoaluminate brought about great disintegration of the epithelial cells of the larvæ, as well as obliterating the cross striations of the muscle fibres. No change in the epithelium or muscle fibres, however, followed, the ingestion of Barium fluesilicate,

and Phenothiazine (Thiodiphenylamine). (Woke, P. A., *J. Agric. Res.*, 1940, 61, No. 5).

Thermal Conductivity of Indian Timbers.—Results of investigations into the thermal conductivity of Indian timbers at the Forest Research Institute, Dehra Dun, has just been published [*Indian Forest Records (Utilisation)*, Vol. II, No. 6, pp. 150-67].

Among structural materials, wood, with its low thermal conductivity, makes an ideal material for house construction, water pipes, tanks, casings, railway and other carriages, drying chambers and cold rooms, etc. Further, thermal conductivity in conjunction with volumetric specific heat is helpful in determining the rate of change of temperature in wood when it is heated or cooled. A knowledge of this is necessary for studies in preservation of wood, sterilisation, fire-resistance, seasoning and the making of plywood.

In spite of the importance of thermal properties of wood, accurate data were almost entirely lacking. The Record now published contains the results of research on 56 species of Indian timbers in air-dry condition, the lightest specimen tested being *Bombax (semul)* and the heaviest, ebony.

The Story of Agmark.—The word "Agmark" was adopted by the Government of India as a symbol of purity. Standard methods of grading and marking have been laid down for a number of commodities, including ghee, eggs, fruits, fruit products, hides and skins, ata, rice, seed lac, tobacco, cotton, edible oils and gur. The story of Agmark dates back to the recommendation of the Royal Commission on Agriculture on devising ways and means for the better marketing of agricultural produce so that the producer may get a better return. A full account of it is given in a pamphlet recently issued by the Agricultural Marketing Adviser to the Government of India.

In the Agmark scheme of quality control emphasis is laid on personal inspection and supervision. Frequent visits are paid by the Central and Provincial marketing officers and others to the premises of graders, distributors and retailers. There are also elaborate arrangements for well-equipped laboratories where samples are analysed and checked under expert supervision.

Tuberculosis Association of India.—**Dr. C. Frimodt-Moller**, the first Medical Commissioner of the Association, had unfortunately to resign his appointment owing to failing health at the end of March 1942. Her Excellency the President of the Association paid a personal tribute to him at the Annual General Meeting of the Association on the 26th March in the following words:—"His knowledge of the disease, his energy, his organising ability, his missionary spirit, have been of invaluable help in the start of this Association and of the many Associations affiliated to it. His advice was sought in every part of India and his tours must have covered many hundreds of miles. He never spared himself and he inspired all those with whom he came in contact with his own enthusiasm. We as an Association will miss his guiding hand sorely and I will miss him also as a friend and as a collaborator in the work which we both have so much at heart. I know that I carry you all with me when I express to him our profound gratitude for the work he has done for India and our heartfelt wishes go with him for the recovery of his health."

Dr. Frimodt-Moller was on medical leave since the 11th of August 1941, and Dr. P. V. Benjamin, Medical Superintendent of the Union Mission Tuberculosis Sanatorium, officiated for him for about five months from the end of October last.

The affiliated Provincial and State Tuberculosis Associations have been asked to recommend names of suitable candidates for the post. The candidates are expected not only to have the necessary academic qualifications in the special subject but should also have had wide experience in both the administrative and clinical fields.

The Indian Ecological Society.—A new centre of the *Indian Ecological Society* was inaugurated at Kolhapur on Wednesday, the 15th April by Mr. S. S. Shirke, Excise Commissioner, Kolhapur State, formerly Professor of Biology, Rajaram College, Kolhapur.

Professor S. A. Parandekar, Head of the Biology Department, Rajaram College, will direct the activities of this centre.

Nagpur University.—At a meeting of the Executive Council of the University held on 1st February 1942, the following resolutions were adopted:

"....that if a student of another university leaves his university on account of war conditions and joins a college in Nagpur University within a reasonable time, the deficiency in his attendance at the lectures and practical work of his course thus resulting, should be condoned by the University provided that he has attended at least 90 per cent. of the lectures and practical work delivered and arranged since his joining the college."

The Council considered the following resolution of the Inter-University Board, India, passed at its last meeting held on the 6th and 7th January 1942, *viz.*,

"....that Universities and Boards be requested to give concessions to students who having done war services resume their studies, in the matter of the rules or regulations pertaining to age, attendance, residence and lectures generally.

"The Inter-University Board further recommends that special courses and classes be organised for the benefit of such students.

"The Inter-University Board requests the Central and Local Governments in the case of students and members of the staff of the universities who have done war service to relax the conditions of appointment in their services,"

and agreed in principle that concession on the lines indicated should be given to the students who have rendered war services.

Calcutta University.—The University has conveyed an assurance to the Registrar, Rangoon University, that the under-graduates of Rangoon University who have evacuated to their homes in India after completion of their courses of study, will receive sympathetic consideration when they apply, with proper certificates, seeking admission to the various examinations.

University of the Punjab.—The Syndicate of the University has permitted students of the University of Rangoon to appear for the examinations, privately or as college students if admitted in the colleges, in which case the deficiency in lectures might be condoned.

The Syndicate has also resolved to frame a general regulation to cover the cases of evacuees from Rangoon and from the jurisdiction of any other Indian University, authorising the Vice-Chancellor to admit them to examinations of the Punjab University on production of satisfactory evidence that the candidate was a *bona fide* student of the aforesaid Universities and would normally have been eligible to appear for an equivalent examination in his own University.

University of Madras.—The Office of the University has temporarily been shifted to Coimbatore.

Prof. K. S. Krishnan has been appointed Professor of Physics at the Allahabad University.

University of Lucknow, *Science Faculty*:—

PH.D.—The theses submitted by (1) Mr. Utsab Kumar Bose, M.SC. (Physics), "Studies in the soft X-rays with a concave grating vacuum spectrograph" and "Studies in cathodic sputtering", and (2) Mr. Ram Rakshpal, M.SC. (Zoology), "Structure and development of reproductive organs in insecta", for the degree of PH.D. have been approved.

D.SC.—The thesis submitted by Mr. Jagdeshwari Dayal, M.SC. (Zoology), "Studies in Helminthology: Trematode parasites of fishes", has been approved.

MAGNETIC NOTES

The month of April 1942 was less disturbed than the preceding month. There were 15 *quiet* days, 12 days of *slight* and 3 days of *moderate* disturbance as against 15 quiet days, 13 days of slight disturbance and 2 of moderate disturbance during April 1941.

The day of largest disturbance during April 1942, was the 4th and that of least disturbance the 22nd. The characters of individual days was as follows:—

Quiet days	Disturbed days	
	Slight	Moderate
5–7, 9, 10, 12, 15, 20–22, 24–26, 28, 29.	1, 3, 8, 11, 13, 14, 16–19, 27, 30.	2, 4, 23.

Two moderate disturbances were recorded during the month of April 1942, as against one of similar intensity in April of last year. The mean character figure for April 1942 is 0·60 as against 0·57 for the same month of last year.

M. R. RANGASWAMI.

SEISMOLOGICAL NOTES

During the month of April 1942, one great and five slight earthquake shocks were recorded by the Colaba seismographs as against one great, five moderate, and four slight ones recorded during the same month in 1941. Details for April 1942 are given in the following table:—

Date	Intensity of the shock	Time of origin I. S. T.		Epicentral distance from Bombay	Co-ordinates of the epicentre (tentative)	Depth of focus	Remarks
March 1942		H.	M.	(Miles)			
8	Great	21	11	3160	Near Lat. 35° N., Long. 122° E. in the Yellow Sea	(Miles) About 90	
9	Slight	01	00		Apparently after shocks of the Great shock of 8th.	..	
9	Slight	05	26				
9	Slight	01	13	3110	..	..	
13	Slight	13	17	5750	..	..	
20	Slight	14	10	4070	..	About 215	

ASTRONOMICAL NOTES

The Sun will be at the summer solstice on June 22, when its north declination reaches its maximum value of 23° 27′.

Planets during June 1942.—Venus is slowly getting closer to the Sun and becoming fainter, but will still be a fairly prominent object in the eastern sky for a couple of hours before sunrise.

Mercury is too near the Sun to be well seen during the month; it will be in inferior conjunction with the Sun on June 13 and reaches a stationary point 11 days later about which time it may possibly be glimpsed low down in the eastern sky in the morning twilight. Mars continues to be visible as a second magnitude star in the western sky at about sunset; while Jupiter which will be in conjunction with the Sun on June 25 can be seen only for a few evenings in the beginning of the month, before it is lost in the evening twilight. Saturn which will have just passed into the morning sky will be still too near the Sun and will not be visible until about the end of the month. About three degrees west of Saturn is Uranus and a close conjunction of the latter with Venus occurs on June 30 (Uranus 1° 41′ North) which perhaps may be helpful to the observer in locating the planet.

T. P. B.

ANNOUNCEMENTS

Indian Statistical Institute.—In accordance with the decision of the Council of the Indian Statistical Institute, arrangements have been made to remove one portion of the Statistical Laboratory to "Amrapali", 87 Barrackpore Trunk Road, P.O., Alambazar, 24 Parganas, in the suburb of Calcutta and another portion to "Mahua", Giridih, in Bihar, about 200 miles from Calcutta, with the help of special grants sanctioned by Government for this particular purpose. The office in Calcutta at Presidency College will continue to be maintained for the present, and a branch office has been opened at "Amrapali", 87 Barrackpore Trunk Road, 24 Parganas, with effect from 15th April 1942. The Honorary Secretary expects to be able to look after the work at Giridih during the next few months, while an Assistant Secretary will be in charge of the work in Calcutta.

Biological Abstracts.—A New Section.—Section F has now been added. It comprises abstracts of Animal Production and Veterinary Science and is designed to meet the needs of men engaged in the animal industries. It will contain all of the abstracts published in the parent edition of *Biological Abstracts* that have to do with the breeding, nutrition, metabolism, husbandry, reproductive and other physiology, anatomy, pathology and parasitology, arthrapod pests of livestock, poultry and semi-domesticated animals and birds, including pet stock.

Research papers in these fields are much more widely scattered throughout the biological literature than is generally assumed. The 514 abstracts in the January issue were drawn from 135 journals. Since *Biological Abstracts* now abstracts the literature in 1,575 periodicals, subscribers to the new section will be assured a very great breadth of selection.

The new section of *Biological Abstracts* will consist of ten abstract issues per year. The annual subscription rate will be $5. Subscribers will receive the index to the complete edition of *Biological Abstracts*.

Special Tuberculosis Number of the *Indian Medical Gazette*.—At the request of the Tuberculosis Association of India, the editor of the *Indian Medical Gazette* has kindly agreed, as in the past, to publish a Special Tuberculosis Number of the *Gazette* in October this year. This will be published on the lines of previous numbers issued since the year 1937.

Articles on any aspect of tuberculosis—clinical, medical or preventive—for the forthcoming number have been invited from tuberculosis workers by the middle of July.

* * *

We acknowledge with thanks receipt of the following:—

"Journal of Agricultural Research," Vol. 64, Nos. 1-2.

"Agricultural Gazette of New South Wales," Vol. 53, Pts. 2-3.

"Annals of Biochemistry and Experimental Medicine," Vol. 2, No. 1.

"Biological Abstracts," Vol. 16, No. 1.

"Journal of Chemical Physics," Vol. 10, Nos. 1-2.

"Journal of the Indian Chemical Society," Vol. 19, No. 2.

"Experiment Station Record," Vol. 86, Nos. 1-2.

"Indian Forester," Vol. 68, No. 5.

"Transactions of the Faraday Society," Vol. 38, Pt. 1.

"Indian Farming," Vol. 3, No. 4.

"Indian Central Jute Committee (Bulletin)," Vol. 5, No. 1.

"Review of Applied Mycology," Vol. 20, Pt. 12 and Vol. 21, Pt. 1.

"Indian Medical Gazette," Vol. 77, No. 4.

Books

"Intermediate quantitative analysis," by Welch. (Oxford University Press), 1941. Pp. 128. Price 3*sh*. 6*d*.

"A manual of geometry," by N. K. Narasimha Murthy. (The Prabhat Book Depot, Bangalore City), 1942. Pp. 120. Price Rs. 1-4.

"High speed Diesel engines" with special reference to automobile and aircraft types, by Arthur W. Judge. (Chapman & Hall, London), 1941. Pp. vii + 535. Price 25*sh*.

"Economic control of iron and steel works," by F. L. Meyenberg. (Chapman & Hall, London), 1942. Pp. xx + 332. Price 25*sh*.

"Matter and energy," by V. Venkata Rao (Telugu). (Published by the Author, Maharaja's College, Vizianagram), 1942. Pp. 102. Price As. 8.

"Sound and light," by R. K. Visvanathan (Tamil) (Annamalai University), 1942. Pp. 252. Price Rs. 1-8.

"The cathode ray tube and its applications," by G. Parr. (Chapman & Hall, London), 1941. Pp. viii + 180. Price 13*sh*. 6*d*.

ACADEMIES AND SOCIETIES

Indian Academy of Sciences: *(Proceedings)*

April 1942. SECTION A.—K. S. K. IYENGAR: *Exact solution of the equations of the general cascade theory with collision loss.* G. V. L. N. MURTY AND T. R. SESHADRI: *Raman effect and hydrogen bonds, Part III. Acetic acid and its mixtures with water and phenol.* G. V. L. N. MURTY AND T. R. SESHADRI: *Raman effect and hydrogen bonds, Part IV. Mixtures of acetic acid with donor substances.* T. S. SUBBARAYA, SYED YUSUFF AND S. SRINIVASA MURTHY: *Interaction of atomic energy levels—V.* T. S. SUBBARAYA, K. SESHADRI AND N. A. NARAYANA RAO: *Interaction of atomic energy levels—VI.* P. I. ITTYERAH AND KANTILAL C. PANDYA: *The condensation of aldehydes with amides. Part X. The condensation of* m- *and* p-*nitrobenzaldehydes and* 2 : 4-*dinitrobenzaldehyde.* V. I. VAIDHIANATHAN AND CHANAN SINGH: *A new phenomenon in the movement of the free water-level in a soil and its bearing on the measurement of water-table.* When there is stratification the top layer of the soil being finer than the bottom one, a falling water-level as observed in a pipe, will begin to rise, without the addition of any water, the top of the soil being exposed to the atmosphere. This phenomenon is caused by a decrease in the pressure deficiency brought about by a flattening of the water menisci at the surface of contact of the two layers of soil. BAWA KARTAR SINGH AND BHUTNATH BHADURI: *Studies on the dependence of optical rotatory power on chemical constitution. Part XIX. Stereoisomeric aminoanilino-, and dimethylaminoanilino-, methylenecamphors, and their derivatives.*

SECTION B.—T. S. RAMAKRISHNAN: *A leaf spot disease of* Zingiber officinale *caused by* Phyllosticta zingiberi *n.sp.* GIRIJA P. MAJUMDAR: *The origin of siphonostele in three species of* Selaginella *spr.* G. D. BHALERAO: *The genus* Cephalogonimus *in India and Burma.* KHAN A. RAHMAN AND ABDUL WAHID KHAN: *Bionomics and control of* Aeolesthes holosericea *F.* (*Cerambycidæ*: *Coleoptera*). M. J. THIRUMALACHAR: Phragmotelium mysorensis, *a new rust on Indian raspberry.* B. G. L. SWAMY: *Female gametophyte and embryogeny in* Cymbidium bicolor *Lindl.* KHAN A. RAHMAN AND ABDUL WAHID KHAN: *A study of the life-history and control of* Batocera horsfieldi *Hope* (*Lamiidæ*: *Coleoptera*)—*A borer pest of walnut tree in the Punjab.* ABDUL HAMID: *Indian water moulds—III.* H. CHAUDHURI AND M. L. BANERJEE: *Indian water moulds—IV.* H. CHAUDHURI: *Indian water moulds—V. A new genus of the* Saprolegniaceae: Hamidia *Gen. nov.*

Mining, Geological and Metallurgical Institute of India

A recent number of the *Transactions* of the Institute (Vol. 37, Pt. 1) contains the Presidential Address delivered by Mr. W. Kirby on the occasion of the Thirty-fifth Annual Meeting of the Institute held at Calcutta sometime back. In the course of his address, Mr. Kirby has dealt with some of the major mining problems being encountered by mining men in the two major coalfields—Jharia and Raniganj—and the steps taken to mitigate the difficulties and dangers arising therefrom. The most important of these problems is that connected with spontaneous fires in these mines caused in a variety of ways and it is necessary to adopt suitable measures immediately for the prevention of these, such as are embodied in the Coal Mines Safety (Stowing) Act of 1939. There are also quite a number of other problems confronting mining men in these areas, especially as workings become deeper and more extensive, such as, ventilation in extensive gassy mines, protection of dwellings and other surface property during pillar extraction, etc. Mr. Kirby concludes: "Success in the future development of mines depends on whether or not we have made the best use of our past experience. Safe and systematic working of mines will in the end prove to be the most economical, and furthermore, our coal resources will be conserved."

The Journal also contains a paper on "An investigation into the wet concentration of the vanadium occurring in the iron ores of Mayurbhanj," which is of special interest in view of the growing importance of vanadium in the iron and steel industry. The occurrence of vanadium-bearing titaniferous iron ores in this area was recently noted by Drs. J. A. Dunn and A. K. Dey of the Geological Survey of India; and Dr. D. Swarup and V. Gopalam Iyer have now investigated the possibility of concentrating the vandium from these ores as iron vanadate, with the ultimate object of working it up as ferro-vanadium. Details of the procedure adopted have been given in the paper. The authors propose to publish in the near future the results of further experimental work which is being carried out on the manufacture of ferro-vanadium from the iron vanadate concentrate, together with a note on the direct smelting of titaniferous iron ore in the iron blast furnace.

Allahabad University—Science Colloquium, 1941-42:

The following subjects were discussed during the year. The names of those who initiated the discussion are also mentioned.

(1) Viscosity of Colloids—Dr. S. Ghosh. (2) Thermal Ionisation—Dr. B. N. Srivastava. (3) Polytropic gas spheres—Mr. H. K. Sen. (4) Magnetic Properties of Hydrated Substances—Dr. Satya Prakash. (5) Surface Waves of Earthquakes—Dr. I. D. Seth. (6) Anti-resonance in Acoustics—(Miss) Chandrakanta. (7) Variable Stars and Banerji's Cepheid Theory of the Planetary System—Mr. H. K. Sen. (8) Brillouin Zone in Crystals—Prof. K. S. Krishnan.

542-42—Printed at The Bangalore Press, Bangalore City, by G. Srinivasa Rao, Superintendent, and Published by B. N. Sastri, M.Sc., A.I.C., A.I.I.Sc., for the Board of Editors, "Current Science", Bangalore.